Clinical Practice Guideline: Management of Isolated Mandibular Body Fractures in Adults Update

José Florencio F. Lapeña Jr., MA, MD,[1,2,,±] Jehan Grace B. Maglaya, BS, MD,[3,4,*,±] Karen Mae A. Ty, RN, MD,[5,6,*] Dann Joel C. Caro, RN, MD,[7,*] Veronica Jane B. Yanga, RN, MD,[8,*] Joselito F. David, BS, MD,[9,10,*] Candice P. Que - Ansorge, BS, MD,[11,12,*] Jay Pee M. Amable, BS, MD,[5,6,*] and the Guideline Development Group (Michael Joseph C. David, BS, MD,[13,14] Amiel Blessa A. Amorado, BS, MD,[15] Ma. Rowena M. Muñoz, MD, MBAH,[11,16] Josefina S. Isidro-Lapeña, MD, MFM,[17,18] Constante M. Rabe, II, RPh, MD,[19,20] Maria Elizabeth Ann P. Marasigan, RN, MMHoA,[21,22] April Grace F. Fernandez, DMD,[23,24] John Alfred S. Sambile, RN, MD,[25,26] Enrico Micael G. Donato, MD, MHA,[10,11,27] Dwight T. Alejo, BS, MD,[28,29]).*

**Guideline Development Group*

±Co-first Authorship

Affiliations:

[1]Director and Trustee, Healthway Philippines Inc. (Healthway Medical Network), Ayala Healthcare Holdings, Inc. (AC Health); [2]Retired Professor and Attending Otorhinolaryngologist, Department of Otolaryngology-Head and Neck Surgery, University of the Philippines College of Medicine and Philippine General Hospital, University of the Philippines Manila; [3]Associate Professor, Department of Otolaryngology-Head and Neck Surgery, University of the East Ramon Magsaysay Memorial Medical Center Inc.; [4]Medical Specialist, Department of Otolaryngology-Head and Neck Surgery, Jose B. Lingad Memorial Medical Center; [5]Assistant Professor, Department of Otolaryngology-Head and Neck Surgery, University of the East Ramon Magsaysay Memorial Medical Center Inc.; [6]Medical Specialist, Department of Otolaryngology-Head and Neck Surgery, Jose R. Reyes Memorial Medical Center; [7]Medical Officer, Department of Otolaryngology-Head and Neck Surgery, Ilocos Training and Regional Medical Center; [8]Section Head, Department of Otolaryngology-Head and Neck Surgery, Manila Doctors Hospital; [9]Consultant, Department of Otolaryngology-Head and Neck Surgery, University of Santo Tomas Hospital; [10]Medical Specialist, Department of Otolaryngology-Head and Neck Surgery, East Avenue Medical Center; [11]Associate Professor, Department of Otolaryngology-Head and Neck Surgery, Manila Central University Filemon D Tanchoco Medical Foundation; [12]Associate Professor, Department of Otolaryngology-Head and Neck Surgery, Metropolitan Medical Center; [13]Board of Trustees, Philippine Society of Otolaryngology-Head and Neck Surgery; [14]Medical Specialist, Department of Otolaryngology-Head and Neck Surgery, Corazon Locsin Montelibano Memorial Regional Hospital; [15]Secretary, Philippine Residents of Otolaryngology-Head and Neck Surgery (PROHNS); [16]Chair, Department of Otolaryngology-Head and Neck Surgery, Cardinal Santos Medical Center; [17]Immediate Past President, Philippine Academy of Family Physicians; [18]Chair, Department of Family and Community Medicine, The Medical City - Ortigas and Clark; [19]Fellow, Philippine Society of Anesthesiologists; [20]Training Officer, Department of Anesthesia, Mariano Marcos Memorial Hospital and Medical Center; [21]Board of Directors, periOperative Registered Nurses Association of the Philippines (ORNAP); [22]Assistant Head Nurse, Operating Room Complex, Manila Doctors Hospital; [23]Member, Philippine Dental Association; [24]Consultant, Department of Dental Medicine, Providence Hospital; [25]Fellow, Philippine College of Radiology; [26]Consultant, Department of Radiology, Premiere Medical Center, Nueva Ecija; [27]Member, Bikers MD Inc.; [28]Member, Brompton Club of the Philippines; [29]Consultant, Department of Otolaryngology-Head and Neck Surgery, Fatima University Medical Center Antipolo

Correspondence: Prof. Dr. José Florencio F. Lapeña, Jr.
Department of Otolaryngology - Head and Neck Surgery
Ward 10, Philippine General Hospital
Taft Avenue, Ermita, Manila 1000
Philippines
Phone: (632) 8554 8467
Email: lapenajf@upm.edu.ph, jflapena@up.edu.ph

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ABSTRACT

Objective

The mandible is the most common fractured craniofacial bone of all craniofacial fractures in the Philippines, with the mandibular body as the most involved segment of all mandibular fractures. Prior to 2021, there were no existing guidelines for the diagnosis and management of mandibular body fractures in particular. General guidelines included the American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAOHNSF) Resident Manual of Trauma to the Face, Head, and Neck chapter on Mandibular Trauma, the American Association of Oral and Maxillofacial Surgeons (AAOMS) Clinical Practice Guidelines for Oral and Maxillofacial Surgery section on the Mandibular Angle, Body, and Ramus, and a 2013 Cochrane Systematic Review on interventions for the management of mandibular fractures. On the other hand, a very specific Clinical Practice Guideline on the Management of Unilateral Condylar Fracture of the Mandible was published by the Ministry of Health Malaysia in 2005. Addressing the prevalence of mandibular body fractures, and dearth of specific guidelines for its diagnosis and management, the Philippine Academy of Craniomaxillofacial Surgery (PACMFS) published a clinical practice guideline (CPG) on the Management of Isolated Mandibular Body Fractures in Adults in 2021. This CPG is part of the Compendium of Department of Health (DOH)-approved clinical practice guidelines of the Republic of the Philippines (available from: *https://doh.gov.ph/dpcb/doh-approved-cpg/*). This guideline update follows the scheduled review process five years from publication of the original CPG and focuses on the management of isolated mandibular body fractures in adults.

Scope and Purpose

This updated multidisciplinary guideline is meant for all clinicians (otolaryngologists – head and neck surgeons, craniomaxillofacial surgeons, as well as primary care and specialist physicians, nurses and nurse practitioners, midwives and community health workers, dentists, and emergency first-responders) providing care to adults aged 18 years and above who present with an acute history and physical and/or laboratory examination findings that may lead to a diagnosis of isolated mandibular body fracture and its subsequent medical and surgical management, including health promotion and disease prevention.

It is applicable in any setting (including urban and rural primary-care, community centers, treatment units, hospital emergency rooms, operating rooms) in which adults with isolated mandibular body fractures would be identified, diagnosed, or managed.

Outcomes are functional resolution of isolated mandibular body fractures; achieving premorbid form; avoiding use of context-inappropriate diagnostics and therapeutics; minimizing use of ineffective interventions; avoiding co-morbid infections, conditions, complications and adverse events; minimizing cost; maximizing health-related quality of life of individuals with

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isolated mandibular body fracture; increasing patient satisfaction; and preventing recurrence in patients and occurrence in others.

Differences from Previous Guideline

This clinical practice guideline is an update and replacement for the original guideline published in 2021 by the Philippine Society of Otolaryngology–Head and Neck Surgery (PSO-HNS). An update was scheduled five years after the initial publication date to include new evidence that might suggest a need for modifying clinically important recommendations. Changes in content and methodology from the prior guideline include the following:

- New evidence from **four (4)** clinical practice guidelines, **nine (9)** systematic reviews, **one (1)** randomized controlled trial, **two (2)** prospective comparative studies, **seven (7)** diagnostic accuracy studies, **two (2)** retrospective cohort studies, **ten (10)** cross-sectional studies, **one (1)** retrospective multi-database review and comparative observational analysis, **two (2)** retrospective observational studies, **one (1)** cadaveric biomechanical experimental study, **two (2)** retrospective case series, **thirteen (13)** narrative reviews, **one (1)** clinical consensus document, and **one (1)** educational review;
- Updated action statement profiles to include current evidence and explicitly state benefit, risks, harms, costs, benefit-harm assessment, value judgements, intentional vagueness, role of patient preferences, exceptions, and differences of opinion;
- New appropriate advice on how the recommendations can be put into practice (**practice tools**) for the tongue blade test and figure-of-eight bandaging;
- Enhanced external review process to include independent critical appraisal of evidence by three expert reviewers;
- Upgrade in Aggregate Evidence Quality to **Grade C, Level II** (Grade C, Level III) for **STATEMENT 2. PANORAMIC X-RAY: Clinicians may request for panoramic x-ray as the initial imaging tool in evaluating patients with a presumptive clinical diagnosis of mandibular fractures.** *Recommendation.*
- Renumbering of STATEMENTS 11 and 12 so that the original STATEMENT 12 is now **STATEMENT 11** and the original STATEMENT 11 is now **STATEMENT 12,** to emphasize that the recommended management for isolated displaced unfavorable and unstable mandibular body fractures is open reduction internal fixation, and that transosseous wiring is only an option in patients who cannot afford or avail of titanium plates,
- Addition of sentence «**In selected cases manual anatomical reduction may suffice**.» to **STATEMENT 13. MAXILLOMANDIBULAR FIXATION: Intraoperative maxillomandibular fixation may not be routinely needed prior to reduction and internal fixation of isolated displaced unfavorable and unstable mandibular body fracture. In selected cases manual anatomical reduction may suffice.** *Recommendation.*

Action Statements

The guideline update development group made *strong recommendations* for the following key action statements: (6) pain management- clinicians should routinely evaluate pain in patients with isolated mandibular body fractures using a numerical rating scale (NRS) or visual analog scale (VAS); analgesics should be routinely offered to patients with a numerical rating pain scale score or VAS of at least 4/10 (paracetamol and a mild opioid with or without an adjuvant analgesic) until the numerical rating pain scale score or VAS is 3/10 at most; (7) antibiotics- prophylactic antibiotics should be given to adult patients with isolated mandibular body fractures with concomitant mucosal or skin opening with or without direct visualization of bone fragments; prophylactic antibiotics can be given 1 hour prior to surgery and up to 24 hours postoperatively; penicillin is the drug of choice while clindamycin may be used as an alternative; and (14) prevention- clinicians should advocate for compliance with road traffic safety laws (speed limit, anti-drunk driving, seatbelt and helmet use) for the prevention of motor vehicle, cycling and pedestrian accidents and maxillofacial injuries.

The guideline update development group made *recommendations* for the following key action statements: (1) history, clinical presentation and diagnosis: clinicians should consider a presumptive diagnosis of mandibular fracture in adults presenting with a history of traumatic injury to the jaw plus a positive tongue blade test, and any of the following physical findings: malocclusion, trismus, tenderness on jaw closure and broken tooth; (2) panoramic x-ray: clinicians may request for panoramic x-ray as the initial imaging tool in evaluating patients with a presumptive clinical diagnosis of mandibular fractures; (3) radiographs: in a setting where panoramic radiography is not available, clinicians may recommend plain mandibular radiography; (4) computed tomography - if available, non-contrast facial CT scans may be obtained; (5) immobilization - fractures should be temporarily immobilized/splinted with a figure-of-eight bandage until definitive surgical management can be performed or while initiating transport during emergency situations; (8) anesthesia - nasotracheal intubation is the preferred route of anesthesia; in the presence of contraindications,

submental intubation or tracheostomy may be performed; (9) observation with a soft diet may serve as management for favorable isolated nondisplaced and nonmobile mandibular body fractures with unchanged pre - traumatic occlusion; (10) closed reduction with immobilization by maxillomandibular fixation for 4-6 weeks may be considered for minimally displaced favorable isolated mandibular body fractures with stable dentition, good nutrition and willingness to comply with post-procedure care that may affect oral hygiene, diet modifications, appearance, oral health and functional concerns (eating, swallowing and speech); (11) open reduction with titanium plates - ORIF using titanium plates and screws should be performed in isolated displaced unfavorable and unstable mandibular body fracture; (12) open reduction with transosseous wiring - with MMF is an option for isolated displaced unfavorable and unstable mandibular body fracture patients who cannot afford or avail of titanium plates; and (15) promotion - clinicians should play a positive role in the prevention of interpersonal and collective violence as well as the settings in which violence occurs in order to avoid injuries in general and mandibular fractures in particular. The guideline update development group also made a *recommendation* for statement (13) maxillomandibular fixation - intraoperative MMF may not be routinely needed prior to reduction and internal fixation; and added the sentence "In selected cases manual anatomical reduction may suffice."

Keywords

Mandibular fractures; jaw fractures; maxillofacial fractures; classification; complications; history; diagnosis; diagnostic imaging; therapy; diet therapy; drug therapy; prevention and control; rehabilitation; surgery

INTRODUCTION

The Philippine Academy of Craniomaxillofacial Surgery (PACMFS) published a clinical practice guideline (CPG) on the Management of Isolated Mandibular Body Fractures in Adults in 2021.[1] This CPG is part of the Compendium of Department of Health (DOH)-approved clinical practice guidelines of the Republic of the Philippines (available from: *https://doh.gov.ph/dpcb/doh-approved-cpg/*).

According to the original CPG[1], the mandible is the most common fractured craniofacial bone, involving 32.3 - 40% of all craniofacial fractures in the Philippines[2,3] in contrast to nasal bone fractures in international literature.[4] The etiology and fracture patterns vary from country to country depending on various environmental and socioeconomic factors.[5] A 2010-2017 survey of eight local otorhinolaryngology – head and neck surgery (ORL-HNS) training institutions (University of the Philippines - Philippine General Hospital, East Avenue Medical Center, Jose R. Reyes Memorial Medical Center, University of Santo Tomas Hospital, Baguio General Hospital and Medical Center, Rizal Medical Center, and the University of the East – Ramon Magsaysay Memorial Medical Center Inc.) revealed the mandibular body as the most commonly involved segment (29%) of all mandibular fractures.[2]

Prior to our original CPG publication, there were no existing guidelines for the diagnosis and management of mandibular body fractures in particular. General guidelines included the American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAOHNSF) Resident Manual of Trauma to the Face, Head, and Neck chapter on Mandibular Trauma[6] and the American Association of Oral and Maxillofacial Surgeons (AAOMS) Clinical Practice Guidelines for Oral and Maxillofacial Surgery section on the Mandibular Angle, Body, and Ramus.[7] Similarly, a 2013 Cochrane Intervention Review attempted to "provide reliable evidence of the effects of any interventions either open (surgical) or closed (non- surgical) that can be used in the management of mandibular fractures, excluding the condyles, in adult patients."[8] On the other hand, a very specific Clinical Practice Guideline on the Management of Unilateral Condylar Fracture of the Mandible was published by the Ministry of Health Malaysia.[9]

Addressing the prevalence of mandibular body fractures, and dearth of specific guidelines for its diagnosis and management, the original clinical practice guideline focused on the management of isolated mandibular body fractures in adults. This guideline update follows the scheduled review process five years from publication of the original CPG.

Definitions of Terms

In this guideline, the mandibular body is defined as the lateral bony region between the first premolar and after the second molar. *(Figure 1)*

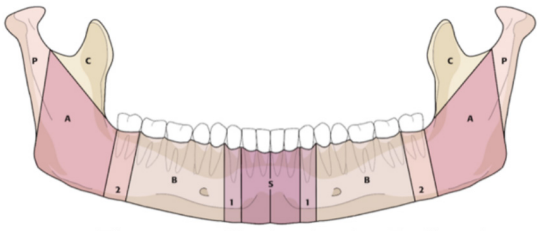


Figure 1. The mandibular body, B, lies between the first premolar and the second molar.[10] Reproduced with permission, from Ehrenfeld M, Manson PN, Prein J. Principles of Internal Fixation of the Craniomaxillofacial Skeleton. 2012. London: Thieme.

The anterior and posterior transition zones, regions bounded by vertical strips in the width of the crowns of the canine and third molar, respectively, are not included in this guideline. *(Figure 2)*

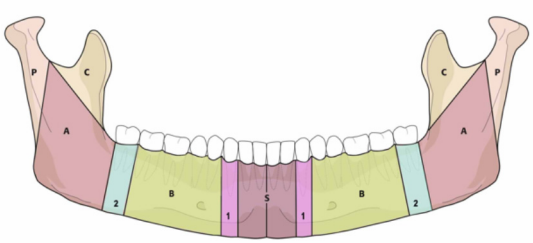


Figure 2. Anterior (pink) and posterior (blue) transition zones (numbered 1 and 2, respectively).[10] Reproduced with permission, from Ehrenfeld M, Manson PN, Prein J. Principles of Internal Fixation of the Craniomaxillofacial Skeleton. 2012. London: Thieme.

An isolated, or simple fracture is defined as a single fracture line producing two fracture fragments *(Figure 3)* as opposed to a complex fracture with one or more intermediate fragment(s) in which there is no contact between the main fragments after reduction or a fracture with more than one fracture line so that there are three pieces or more.

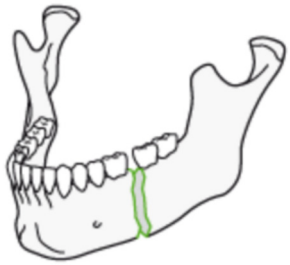


Figure 3. Diagram illustrating an isolated, or simple fracture of the mandible body.[11] (AO surgery reference) Copyright by AO Foundation Switzerland. Reproduced with permission from the Arbeitsgemeinschaft für Osteosynthesefragen (AO) Surgery Reference Glossary. Online AO Surgery Reference. [cited 2026 June 15]. Available from *https://surgeryreference.aofoundation.org/cmf/trauma/mandible/body-simple*

Guideline Scope and Purpose

This updated multidisciplinary guideline is meant for all clinicians in any setting who interact with adults aged 18 years and above, who present with an acute history and physical and/or laboratory examination findings that may lead to a diagnosis of isolated mandibular body fracture and its subsequent medical and surgical management, including health promotion and disease prevention.

The updated guideline does *not* apply to mandibular body fractures with concomitant fractures elsewhere in the mandible, craniomaxillofacial, or cervical skeleton. It also does not apply to conditions associated with pathologic bone lesions/disease (osteoradionecrosis, pericoronitis, periodontal pockets, odontogenic cysts); gunshot injuries; iatrogenic mandibular fractures (intraoperative fracture associated with tooth removal); Langerhans cell histiocytosis and in patients who are unconscious, obtunded or neurologically unstable.

Other modifying factors such as edentulous mandible; congenital, developmental, structural, metabolic, infectious, neoplastic disorders / conditions affecting the mandible; atrophic mandible; tooth injuries/ periodontal trauma; alveolar fracture involvement; and bone loss/ defect fracture are not the primary focus of this guideline, but may be discussed relative to their impact on management.

In particular, this guideline is for the use of providers of health care to adults 18 years and older, including primary care and specialist physicians, nurses and nurse practitioners, midwives and community health workers, dentists and emergency first-responders. When appropriate, practice tools are specified for these other providers.

It is applicable in any setting (including urban and rural primary-care, community centers, treatment units, hospital emergency rooms, operating rooms) in which adults with isolated mandibular body fractures would be identified, diagnosed, or managed.

Although it was developed with input from other specialties and contains key action statements directed toward them, the intent is to provide guidance specifically for otolaryngologists – head and neck surgeons in general and craniomaxillofacial surgeons in particular. These surgeons and other specialists (such as radiologists and anesthesiologists) are assumed to possess the basic knowledge and skills needed to implement the pertinent action statements.

The primary outcome is to have a functional resolution of isolated mandibular body fractures. Additional outcomes include achieving premorbid form; avoiding use of context-inappropriate diagnostics and therapeutics; minimizing use of ineffective interventions; avoiding co-morbid infections, conditions, complications and adverse events; minimizing cost; maximizing health-related quality of life of individuals with isolated mandibular body fracture; increasing patient satisfaction; and preventing recurrence in patients and occurrence in others.

METHODS

General Methods and Literature Searches

In developing this update of the original evidence-based clinical practice guideline,[1] the methods outlined in the AAO-HNSF Guideline Development Manual (3rd edition)[12] were followed.

An eight-person Guideline Update Working Group (GUWG) consisting of a Guideline Development Group (GDG) Chair (JGBM), Guideline Update Working Group (GUWG) Chair/Methodologist (JFFL), three Staff Leads (DJCC, KMAT, VJBY), and three Consultants (JFD, CPQA, JPMA) was convened. All eight GUWG members were previously involved in the original 2021 CPG on the management of isolated mandibular body fractures in adults.[1] The GUWG met from January to April 2026 to review and update the original 2021 CPG, evaluating the original recommendations for relevance, gaps, controversies, and new medical evidence to determine if they needed modification or removal. Ultimately, the GUWG decided that while the 15 existing action statements were still valid, they should be updated to incorporate additional evidence while considering facilitators and barriers to implementation.

A systematic search was performed by the GUWG to identify systematic reviews, clinical practice guidelines, manuals, randomized controlled trials (RCTs), and original articles published since the prior guideline.[1] The original search was updated from October 2017 to April 2026 to include MEDLINE (PubMed) and PubMed Central, the Cochrane Library, the World Health Organization (WHO) Global Index Medicus, particularly the Western Pacific Region Index Medicus (WPRIM), Directory of Open Access Journals (DOAJ), HERDIN Plus, and Google Scholar using the following MeSH terms as search keywords for all key action statements (KAS): *"mandibular fractures"* or *"maxillofacial fractures"* AND *"body"* AND *"adults"*. The search was further narrowed down per KAS using specific keywords such as *"physical exam," "panoramic radiography," "antibiotics," "anesthesia,"* and other key action statement related keywords to narrow down the initial search. The initial search results were filtered to include only human studies and articles written in the English language. Additional evidence was identified, as needed, with targeted searches to support the needs of the guideline working group in updating sections of the guideline text. After assessing the quality and relevance of the initial search, we retained a total of **fifty-six (56)** new studies as part of supporting evidence for this updated clinical practice guidelines. Specifically, we retained **four (4)** clinical practice guidelines, **nine (9)** systematic reviews, **one (1)** randomized controlled trial, **two (2)** prospective comparative studies, **seven (7)** diagnostic accuracy studies, **two (2)** retrospective cohort studies, **ten (10)** cross-sectional studies, **one (1)** retrospective multi-database review and comparative observational analysis, **two (2)** retrospective observational studies, **one (1)** cadaveric biomechanical experimental study, **two (2)** retrospective case series, **thirteen (13)** narrative reviews, **one (1)** clinical consensus document, and **one (1)** educational review. A sample search for the first KAS is shown in *Figure 4.* Sample searches for the 14 other KAS are available upon request.

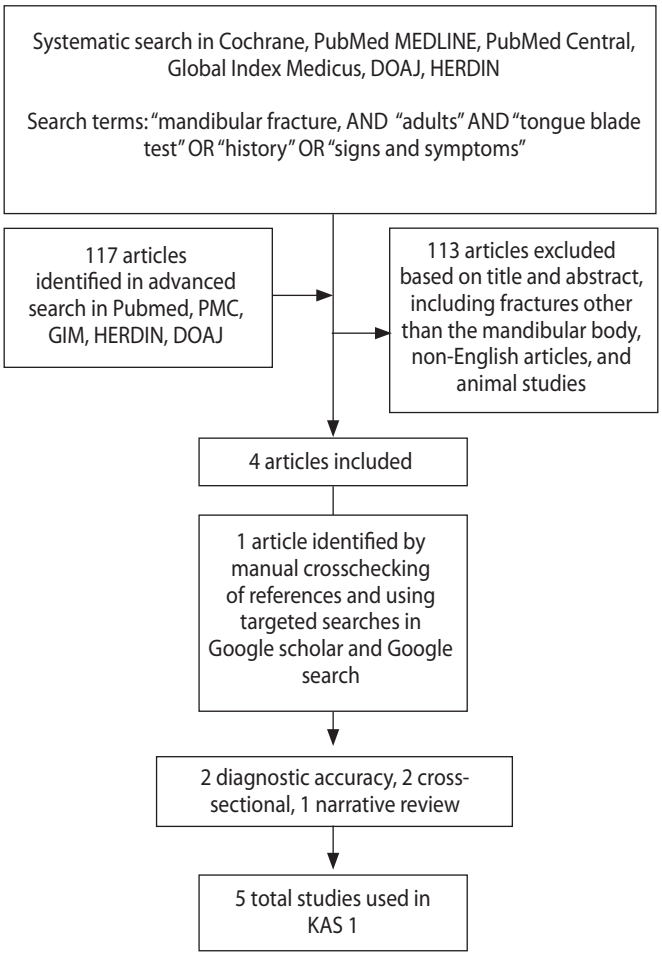


Figure 4. Search Strategy for the first key action statement

All literature was appraised and classified by an external, independent group of three epidemiologists from April 10 to May 8, 2026, according to the Oxford Centre for Evidence-Based Medicine 2011 (OCEBM Levels of Evidence Working Group).[13] The expert reviewers appraised each full-text article independently before meeting to agree on a consensus classification per article. Studies with levels I and II grading were prioritized in updating the supporting text per KAS. However, Lower-level evidence articles were still included whether they supported or contradicted the KAS. None of the new articles contradicted the KAS, thus, the new studies with lower levels

of evidence that supported the KAS were treated as supporting literature and were considered not to affect the aggregate evidence of the study. Selected clinical practice guidelines with lower level evidence but strong clinical application were re-evaluated by the same independent group of three epidemiologists from May 11-26, 2026 using the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument.[14] The three expert reviewers evaluated each full-text article separately before tallying their scores and arriving at a consensus for both the OCEBM and AGREE II appraisals.

A Guideline Development Group (GDG) was also organized, consisting of the same GDG Chair (JGBM), GDG Co-Chair/Methodologist (JFFL), three Staff Leads (DJCC, KMAT, VJBY) and three consultants (JFD, CPQA, JPMA). In addition, a Philippine Society of Otolaryngology - Head and Neck Surgery (PSO-HNS) Liaison (MJCD), an Otorhinolaryngology - Head and Neck Surgery Resident Representative (ABAA), a Maxillofacial Surgeon (MRMM), a Family Physician (JSIL), an Anesthesiologist (CMR), a Operating Room Nurse (MEAPM), a Dentist (AFF), a Radiologist (JASS), a Motorcycle Rider (EMGD), and a Bicyclist/Commuter/Pedestrian as consumer advocate (DTA) were invited and agreed to participate. A copy of the original 2021 clinical practice guideline[1] was provided to each GDG member who was asked to review it several months before a scheduled workshop.

The GUWG meetings were held monthly from February to April 2026 then weekly from May 13 to June 13, 2026 to deliberate on the key action statements for any possible revisions, discuss the recent evidence, and refine the supporting statements prior to their presentation to the GDG. The evidence supporting each KAS was identified, appraised, and summarized and an explicit link between evidence and statements was defined. The strengths and limitations of the evidence were also deliberated on and summarized. The evidence profile for each statement was converted into an action statement profile which was moved up in the text to precede the supporting evidence (previous and updated). Statements about the Benefit, Risks, harms, costs, Benefit-harm assessment, Value judgements, Intentional vagueness (with clear options for management), Role of patient preferences, Exceptions (exclusions to whom the action statement does not apply), Policy level, Differences of opinion, and Changes from the 2021 guideline were deliberated on and included after each action statement profile. The current guideline supporting text was then written below the original guideline supporting text.

The supporting text and action statement profiles clearly summarize specific and unambiguous recommendations, presenting different options for management when applicable, with appropriate advice on how the recommendations can be put into practice (practice tools). Where applicable, facilitators and barriers to guideline implementation are mentioned, including current potential cost and resource implications of applying recommendations and the role of patient (and health provider) preferences. These additions reflect the current methodology for guideline development by the AAO-HNSF, conform to the Institute of Medicine's standards for developing trustworthy guidelines,[12] and comply with the AGREE II instrument.[14] An updated copy of the 15 Key Action Statements with their previous and updated supporting evidence, action statement profiles, and original and current guideline supporting texts was provided to the GDG members for their perusal and comments in preparation for the GDG workshop.

A workshop involving all the GDG members was held on June 24, 2026 to discuss and refine the updated clinical practice guidelines. A Delphi Process was utilized to arrive at consensus on the final and revised 15 key action statements and their respective action statement profiles. A sample of the Delphi instrument is in *Appendix 1*. Panelists individually rated their agreement with each key action statement on a 9-point Likert scale labeled at intervals (1 - strongly disagree, 3 – disagree, 5 – neutral, 7 – agree, 9 – strongly agree), and the mean scores were computed and projected for discussion.

Accepted criteria for consensus[15] were applied. Consensus meant statements achieving a mean score of ≥7.00 and having no more than one outlier (that is, any rating ≥2 Likert points from the mean in either direction); Near Consensus meant statements achieving a mean score ≥6.50 and having no more than two outliers (any rating ≥2 Likert points from the mean in either direction); No Consensus meant statements that did not meet the criteria of consensus or near consensus. For purposes of emphasis, Strong Consensus was defined as a mean Likert score ≥8.00 with no outliers.[15] The Delphi individual ratings and averages per item are seen in *Figure 5*.

Classification of Evidence-Based Statements

Evidence-based statements reflect both the quality of evidence and the balance of benefit and harm that is anticipated when the statement is followed. The definitions for evidence-based statements adapted from the Oxford Levels of Evidence 2011[13] by the AAOHNSF[12] were used in this CPG.

Financial Disclosure and Conflicts of Interest

A contract grid was accomplished by each Guideline Development Group and Guideline Update Working Group member for the 1st

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
JFFL	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
JGBM	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
JFD	x	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9
CQA	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
JPMA	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
DJCC	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
KMAT	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
VJBY	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
JSIL	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
EMGD	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
MRMM	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
DTA	x	9	9	7	9	9	7	9	9	9	9	9	9	9	9	9
MJCD	x	9	9	9	9	9	9	9	9	9	9	9	9	9	8	8
JASS	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
CMR	x	9	9	8	8	9	9	8	7	7	8	8	8	8	8	8
MEAPM	x	9	8	8	9	8	9	8	8	8	8	9	8	7	9	9
AGFF	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
ABAA	x	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
		162	161	157	161	161	160	160	159	159	160	161	160	159	160	160
AVE		**9**	**8.9**	**8.7**	**8.9**	**8.9**	**8.9**	**8.9**	**8.8**	**8.8**	**8.9**	**8.9**	**8.9**	**8.8**	**8.9**	**8.9**
Mean +2		11	10.9	10.7	10.9	10.9	10.9	10.9	10.8	10.8	10.9	10.9	10.9	10.8	10.9	10.9
Mean -2		7	6.9	6.7	6.9	6.9	6.9	6.9	6.8	6.8	6.9	6.9	6.9	6.8	6.9	6.9

Figure 5. Individual ratings and average ratings per key action statement obtained from the Delphi process showing strong consensus for all statements

conference meeting on June 24, 2026; copies of the Policy for Management of Financial Conflicts of Interest in the Development of ATS Clinical Practice Guidelines,[16] Conflict of Interest Guidelines for Clinical Guidelines[17] and Disclosures of conflicts of interest in clinical practice guidelines[18] were also provided per panelist to stress the importance of COI disclosures. These included non-financial conflicts (intellectual passion, personal relationships, institutional and professional affiliations, political or religious beliefs). Each GUWG and GDG member accomplished the ICMJE Disclosure Form (13/13/2021 version, available from: https://www.icmje.org/disclosure-of-interest/). After review and discussion of their disclosures, panelists agreed to remind the panel of potential conflicts before any related discussion, and to recuse themselves from any discussion related to their potential conflict of interest if so requested. Panelists also agreed to maintain confidentiality about proceedings until the final CPG was publicized. The three external reviewers were compensated for their services, and also accomplished conflict of interest disclosures and non-disclosure agreements prior to being contracted. This CPG is editorially independent of the sponsor and funder (Philippine Society of Otolaryngology - Head and Neck Surgery), whose views have not influenced the development of the guideline.

Stakeholder Involvement

The original key action statements and action statement profiles were pilot-presented to local clinicians in a provincial setting (Maxillofacial Seminar and Workshop on Mandibular and Midface Fractures, Philippine Academy of Craniomaxillofacial Surgery and Bicol ENT-HNS Chapter, Naga City, October 28, 2017), and before a national convention of otolaryngologists (PSO-HNS 61st Annual Convention and 10th International Symposium on Recent Advances in Rhinosinusitis and Nasal Polyposis, The Manila Hotel, December 1, 2017). The original CPG was then presented at a national forum of family physicians and general practitioners (Philippine Academy of Family Physicians 57th Anniversary and Annual Convention, Philippine International Convention Center, March 2, 2018), and an international conference of otolaryngologists (10th International Academic Conference in Otology, Rhinology, and Laryngology, Fairmont Hotel, Makati City, March 2, 2018). It was also presented during the PACMFS Maxillofacial Seminar and Workshop on Mandibular and Midface Fractures at the Ilocos Training and Regional Medical Center, San Fernando, La Union on November 16, 2018; as part of the Basic Facial Plastic and Maxillofacial Course, PSO-HNS, Philippine Academy of Facial Plastic and Reconstructive Surgery (PAFPRS), and PACMFS at the Manila Doctors Hospital on April 26, 2019; the PACMFS Maxillofacial Seminar and Workshop at the Jose B. Lingad Memorial Regional Hospital in San Fernando, Pampanga, July 11, 2019; the PACMFS Maxillofacial Seminar and Workshop on Mandibulo-Maxillary Fixation (MMF) and Mandibular and Midface Fractures at the Paulino J. Garcia Memorial Research and Medical Center in Cabanatuan City, Nueva Ecija on February 7, 2020; and as a keynote lecture at the Arbeitsgemeinschaft für Osteosynthesefragen CranioMaxilloFacial (AOCMF) Asia Pacific Management of Facial Trauma course in Thiruvalla, Kerala, India on January 4, 2020.

The views and preferences of stakeholders were sought and valuable feedback on each KAS of the CPG was obtained in these fora. The CPG itself was implemented by Fellows of the PACMFS and PSO-HNS in particular, as well as Plastic, Reconstructive and Aesthetic Surgeons and General Surgeons from 2021 to 2025, as documented in a 2025-2026 national survey on the Knowledge, Attitudes and Practices of Selected Filipino Surgeons Regarding the Clinical Practice Guidelines on the Management of Isolated Mandibular Body Fractures In Adults.[19] Facilitators and barriers to guideline implementation were obtained form the various fora as well as the national survey, and considered throughout the CPG updating process.

Updated Version of the Guideline

This updated version was rewritten by the two Chairs as co-first authors (JFFL, JGBM) with the assistance of Craniomaxillofacial Surgery Fellows (KMAT, DJCC, VJBY), and GUWG consultants (JFD, CPQA, JPMA), who re-checked all statements, citations, and references. It was submitted for review to the National Practice Guidelines Program, Disease Prevention and Control Bureau - Evidence Generation and Management Division of the Department of Health, Republic of the Philippines before July 31, 2026. Responses to the appraisal received on September 7 and corresponding revisions were submitted on September 30, 2026. Following approval by the NPGP, DPCB on November 6, 2026, it was approved by all the GDG members.

The updated key action statements and action statement profiles were pilot-presented to local clinicians at a Post-graduate Workshop on Head and Neck Prosthesis (Makati Medical Center, September 26-27, 2026), the Philippine Academy of Craniomaxillofacial Surgery General Assembly (Boracay Room, EDSA Shangri-La Hotel, December 2, 2026), and before a national convention of otolaryngologists (PSO-HNS 70th Annual Convention at the EDSA Shangri-La Hotel, December 2, 2026). This CPG update was also presented internationally at the *Arbeitsgemeinschaft für Osteosynthesefragen CranioMaxilloFacial* (AOCMF) FACE Ahead Summit 2026 (Bangkok, Thailand, October 1-3, 2026).

The recommendations in this CPG update are based on the best available published data through April 2026. Specific advice and/or tools on how the guidelines can be put into practice, as well as facilitators and barriers to guideline implementation, are detailed when appropriate under the respective KAS, action statement profile, and supporting text. Each KAS specifies the criteria for monitoring. As recommended by Edora and Lapeña, "future studies may incorporate mixed methods designs, including chart audits and qualitative interviews, to validate self-reported practices and explore contextual drivers of decision-making. Longitudinal evaluations of educational or systems-based interventions could further clarify how guideline uptake evolves over time and across training levels. Clinically, institutions may consider developing shared, cross-specialty protocols for mandibular trauma management that integrate guideline recommendations with local resource realities."[19] A scheduled review process will occur another five years from publication of this updated CPG or sooner if new compelling evidence warrants earlier consideration.

UPDATED GUIDELINE KEY ACTION STATEMENTS

This guideline has fifteen (15) key action statements, grouped into diagnosis (1-4), treatment (5-13) and disease prevention and health promotion (14-15). Each evidence-based statement is organized in a similar fashion: an evidence-based key action statement in bold, followed by the strength of the recommendation in italics, and the grade and level of evidence in boldface. Each key action statement is followed by an action statement profile which explicitly states the aggregate evidence quality; benefit; risks, harms, costs; and benefit-harm assessment. Additionally, there is an explicit statement of any value judgments, the role of patient (caregiver) preferences, clarification of any intentional vagueness by the panel, exceptions to the statement, a repeat statement of the strength of the recommendation, any differences of opinion, and changes from the 2021 guideline. Several paragraphs subsequently discuss the evidence base supporting the statement. An overview of each evidence-based statement in this guideline can be found in *Table 1*.

Table 1. Summary of guideline key action statements

Statement	Action	Strength
1. History, clinical presentation and diagnosis	Clinicians should consider a presumptive diagnosis of mandibular fracture in adults presenting with a history of traumatic injury to the jaw plus a positive tongue blade test, and any of the following physical findings: malocclusion, trismus, tenderness on jaw closure and broken tooth.	Recommendation
2. Panoramic x-ray	Clinicians may request for panoramic x-ray as the initial imaging tool in evaluating patients with a presumptive clinical diagnosis of mandibular fractures.	Recommendation
3. Radiographs	In a setting where panoramic radiography is not available, clinicians may recommend plain mandibular radiography among patients with presumptive clinical diagnosis of mandibular fracture.	Recommendation
4. Computed Tomography	If available, non-contrast facial CT scans may be obtained for the assessment of mandibular fractures.	Recommendation
5. Immobilization	Isolated mandibular body fractures should be temporarily immobilized/splinted with a figure-of-eight bandage until definitive surgical management can be performed or while initiating transport during emergency situations.	Recommendation
6. Pain Management	Clinicians should routinely evaluate pain in patients with isolated mandibular body fractures using a numerical rating pain scale or visual pain analog scale. Analgesics should be routinely offered to patients with numerical rating pain scale score or VAS of at least 4/10. Patients may be initially managed with paracetamol and a mild opioid with or without an adjuvant analgesic. Reassessment should be given until the numerical rating pain scale score or VAS is 3/10 at most.	Strong recommendation

Statement	Action	Strength
7. Antibiotics	Prophylactic antibiotics should be given to adult patients with isolated mandibular body fractures with concomitant mucosal or skin opening with or without direct visualization of bone fragments. In patients without mucosal or skin lacerations, prophylactic antibiotics can be given 1 hour prior to surgery and up to 24 hours postoperatively. Penicillin is the drug of choice while clindamycin may be used as an alternative for patients in whom penicillin is contraindicated.	Strong Recommendation
8. Anesthesia	Nasotracheal intubation is the preferred route of anesthesia in patients diagnosed with isolated mandibular body fracture. In the presence of contraindications to nasotracheal intubation, submental intubation or tracheostomy may be performed.	Recommendation
9. Observation	Observation with soft diet may serve as management for patients diagnosed with favorable isolated nondisplaced and nonmobile mandibular body fractures with unchanged pre - traumatic occlusion.	Recommendation
10. Closed Reduction	Closed reduction with immobilization by maxillomandibular fixation for 4-6 weeks may be considered in patients with minimally displaced favorable isolated mandibular body fracture with stable dentition, good nutrition and who are willing to comply with post-procedure care that may affect oral hygiene, diet modifications, appearance, oral health and functional concerns (eating, swallowing and speech).	Recommendation
11. Open Reduction with Titanium Plates	Open reduction internal fixation using titanium plates and screws should be performed in isolated displaced unfavorable and unstable mandibular body fractures.	Recommendation
12. Open Reduction with Transosseous wiring	In patients with isolated displaced unfavorable and unstable mandibular body fracture who cannot afford or avail of titanium plates, transosseous wiring with maxillomandibular fixation is an option.	Recommendation
13.Maxillomandibular Fixation	Intraoperative maxillomandibular fixation may not be routinely needed prior to reduction and internal fixation of isolated displaced unfavorable and unstable mandibular body fracture. *In selected cases manual anatomical reduction may suffice.*	Recommendation
14. Prevention	Clinicians should advocate for compliance with road traffic safety laws (speed limit, anti-drunk driving, seatbelt and helmet use) for the prevention of motor vehicle, cycling and pedestrian accidents and maxillofacial injuries.	Strong Recommendation
15. Promotion	Clinicians should play a positive role in the prevention of interpersonal and collective violence as well as the settings in which violence occurs in order to avoid injuries in general and mandibular fractures in particular.	Recommendation

STATEMENT 1. HISTORY, CLINICAL PRESENTATION AND DIAGNOSIS: Clinicians should consider a presumptive diagnosis of mandibular fracture in adults presenting with a history of traumatic injury to the jaw plus a positive tongue blade test, and any of the following physical findings: malocclusion, trismus, tenderness on jaw closure and broken tooth. *Recommendation.*

Grade B Recommendation, Level II

Action Statement Profile for Statement 1

- Aggregate Evidence Quality: Grade B, Level II
- Benefit: Clinicians can presumptively rule in or rule out a diagnosis of mandibular fracture during the initial patient encounter; potential savings from avoiding unnecessary radiographs, medical treatment, and costly procedures for patients without mandibular fractures.
- Risks, harms, costs: None
- Benefit-harm assessment: Preponderance of benefit over harm

- Value judgements: Although the guideline development group recognizes that a conclusive diagnosis of mandibular fracture may be difficult without imaging, making a presumptive diagnosis of mandibular fracture based on history and physical examination alone is reasonable. Patients highly suspected to have a mandibular fracture (based on clinical signs and positive tongue blade test) can be referred early to specialists.
- Intentional vagueness: None
- Role of patient preferences: Small; patients can refuse examination.
- Exceptions: Airway compromise, loose dentition, uncooperative patients, altered states of consciousness
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

PRACTICE TOOLS

For purposes of this CPG the tongue blade test is properly done by asking the patient to bite on a wooden tongue depressor on the ***contralateral*** side of the suspected mandibular injury without yielding while the examiner attempts to pull the tongue blade out. Normally, the masseter muscles are strong enough to withstand the pulling force from the examiner. If the patient cannot bite down and lets go of the tongue blade due to pain, we can presume the presence of mandibular fracture (positive tongue blade test).

GUIDELINE SUPPORTING TEXT

There were thirty-eight (38) studies included in our original review: one (1) meta-analysis, one (1) retrospective cohort study, and thirty-six (36) cross-sectional studies.

In several studies, motor vehicle accidents and interpersonal violence were the major causes of trauma resulting in mandibular fractures.[3,5,20–46] In the USA, the body of the mandible was the second or third most frequently fractured part of the mandible, after the angle and parasymphyseal areas.[38–40,46] However, in other countries, the body of the mandible was the most frequently fractured region, whether caused by vehicular accidents, gunshot, falls, violent assaults or sports. The mandibular body was also found to be the most common site of fracture, whether as a single fracture or one among multiple fractures.[3,5,20,21,24,43,47] Variations on the cause of injury were noted depending on the age, sex, and socioeconomic conditions of the country or city as well as time of the year where the accident or assault occurred.[20,22,25,27,28,31,37,38,41,43–47] In Western Europe and the United States of America, interpersonal violence or altercations were considered the leading cause of trauma to the head and jaw.[22,27,36,38,39,41,44,46] However, in Asia, Africa and South America, motor vehicle accidents were the leading cause of mandibular fractures,[3,20,21,24–26,29,31,32,40,43,45,46] although in a South Korean study as well as in a Brazilian study, violent assaults outnumbered traffic accidents.[30,37] In the Philippines, the etiology of mandibular fractures appeared to be conflicting, with studies showing motor vehicle accidents overshadow assault or interpersonal violence as the common cause of mandibular fractures,[3,5,23] while another study reported assaults or mauling a major cause.[33] A history of blunt or sharp force to the jaw suggests the possibility of mandibular fracture.[22,31,34,35,38,39,46,48] Patients with mandibular fractures complain of pain, change in occlusion and numbness, with or without lacerations, in the chin area, and commonly present with facial swelling, limitation of mouth opening, malocclusion and inferior alveolar nerve and/or mental nerve paresthesia.[27,32,49] The absence of malocclusion, trismus, tenderness on jaw closure, broken tooth, and step-deformity, and a negative tongue blade test may rule out mandibular fracture and avoid further radiographic testing.[48–53] With the high sensitivity and negative predictive values of clinical signs and the tongue blade test, the clinician can presumptively rule out the diagnosis of mandibular fracture during the initial patient encounter.[48,49,51–53] A systematic review (short review in 2003 by Malhotra and Dunning of two diagnostic studies on the use of the tongue blade test) showed the high sensitivity and high negative predictive value (computed during appraisal) of the tongue blade test in ruling out the diagnosis of mandibular fracture.[51] The studies reviewed compared the tongue blade bite test to plain radiography which was the acceptable surrogate gold standard at that time.[48,52] Newer diagnostic studies have been published that compared the utility of the tongue blade test to the new gold standard, computed tomography (CT), in diagnosing mandibular fractures. These studies affirm that the bite test or tongue blade test is highly sensitive and specific for predicting mandibular fractures.[53–55] The clinical signs seen in patients with mandibular trauma have also been found to be useful in ruling out mandibular fractures.[49,50,52] One study developed a "maximally sensitive" clinical decision tool (absence of malocclusion, tenderness on jaw closure, broken tooth, trismus and step deformity) that will enable a clinician to rule out the diagnosis of fracture and obviate the need to request for radiographic studies.[50]

CURRENT GUIDELINE SUPPORTING TEXT

Five (5) additional studies were included in this update consisting of two (2) diagnostic accuracy studies, two (2) cross-sectional surveys, and one (1) narrative review.

This update further emphasizes the importance of recognizing the physical findings associated with mandibular fractures in making a presumptive diagnosis. Physical exam findings such as malocclusion, trismus, broken tooth, or step deformity, are key clinical indicators that should trigger requests for imaging and other diagnostic modalities.[56–59] These symptoms combined with a positive tongue blade test are considered good clinical indicators of a mandibular fracture.[56,59] Although these studies[56,59] require breaking the tongue blade for a negative test, others only require the inability of the examiner to pull the tongue blade out from the patient's clenched teeth to record a negative test.[54] Recent studies showed that a positive tongue blade test combined with malocclusion and jaw tenderness on palpation demonstrated 100% specificity in detecting mandibular fractures, while a negative tongue blade test has 96% sensitivity in ruling out mandibular fractures.[56,59] A recent study showing high knowledge scores (93.22%) on the use of the tongue blade test among surgeons further supports this statement.[19] This shows good clinical relevance of the tongue blade test in the current management of mandibular body fractures.

This update affirms the importance of knowing the clinical findings associated with mandibular fractures.[19,56–59] Additionally, recent data further confirms the utility of tongue blade tests in accurately identifying mandibular fractures needing imaging while avoiding unnecessary diagnostic tests as well.[19,56,59]

STATEMENT 2. PANORAMIC X-RAY: Clinicians may request for panoramic x-ray as the initial imaging tool in evaluating patients with a presumptive clinical diagnosis of mandibular fractures. *Recommendation.*

Grade C Recommendation, Level II

Action Statement Profile for Statement 2

- Aggregate Evidence Quality: originally Grade C, Level III, upgraded to Grade C, Level II
- Benefit: Panoramic x-rays provide a single, comprehensive view of the mandible with less radiation exposure and faster results than mandibular series; easier interpretation due to decreased bone superimpositions with less missed fractures including status of existing dentition.
- Risks, harms, costs: Panoramic x-rays may fail to differentiate between inner and outer table fractures. Radiation doses range between 4.7-14.9 µSv per exposure; technique usually requires upright position; direct cost of procedure ranges from PhP 450.00 - 1,825.00
- Benefit-harm assessment: Preponderance of benefit over harm
- Value judgements: Although the panel recognizes the superior role of CT scans in imaging mandibular fractures, this superiority is not significantly better than panoramic x-rays for simple mandible body fractures. Panoramic x-rays are more accessible, affordable, and entail less radiation exposure than mandibular series and CT scans. However, use is limited to patients who can stand or sit upright. In the Philippines, most trauma patients from middle to marginalized sectors are brought to government hospitals where plain radiographs and/or panoramic x-rays are readily available.
- Intentional vagueness: None
- Role of patient preferences: Small
- Exceptions: Inability to tolerate upright position and unavailability of panoramic x-ray
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: Aggregate Evidence Quality was upgraded to Level II, Grade C (from Level III, Grade C)

GUIDELINE SUPPORTING TEXT

Six (6) studies were reviewed, consisting of two (2) diagnostic cross-sectional studies, one (1) clinical trial, two (2) narrative reviews, and one (1) training manual.

Meticulous clinical examination of the mandibular area is critical when a mandibular fracture is suspected. When there is a presumptive clinical diagnosis of a mandibular fracture, imaging studies should be carried out. The modality should entail optimal preoperative and intraoperative case management, minimizing treatment failures and complication rates.[60,61] A standard panoramic radiograph is noted to show the most comprehensive view with a single film.[61] Panoramic radiography is also referred to as panographic view, pantomography and orthopantomography. It is also useful in examining dentition, the presence of impacted teeth with respect to the fracture, and the alveolar process and portion of the mandibular canal. It has 92% diagnostic accuracy over standard radiographs.[60] Hence, it is the most suitable screening film for the radiographic examination of the mandible.[60–63] Panoramic x-rays provide less exposure to radiation and present faster results compared with other modalities. Effective radiation doses ranged between 4.7-14.9 µSv for one exposure.[64] Several disadvantages were noted: 1) patients are required to be positioned upright, which may be disadvantageous to patients with limited mobility; 2) the image produced is a 2-dimensional view, which results in a limited evaluation

of buccal and lingual displaced fractures; and 3) details may not be appreciated in the symphyseal area.[65]

CURRENT GUIDELINE SUPPORTING TEXT

Nine (9) additional studies were reviewed in this update including four (4) diagnostic accuracy studies, one (1) cross-sectional study, and four (4) narrative reviews.

This update further supports the use of panoramic radiography as a good initial imaging modality in evaluating patients with a presumptive diagnosis of mandibular fractures. The four new level two studies were considered sufficient to upgrade the aggregate evidence quality to level two from level three. Panoramic x-rays or orthopantomograms (OPGs) are beneficial in providing good visualization of the entire mandible which is particularly helpful in a setting where computed tomography (CT) scans are not readily available.[66,67] Panoramic x-rays have a high sensitivity (92%) in ruling out mandibular fractures compared to plain mandibular series x-rays (66%).[57] Although poor in identification of anterior mandibular fractures due to superimposition of the cervical spine, panoramic x-rays are excellent in displaying fractures of the mandibular body and offer lower cost, widespread accessibility, and decreased radiation doses than CT.[57,67] Hence, they are considered the most suitable screening modality for mandibular fractures.[57,67,68]

However, panoramic x-rays still have limitations such as patient positioning, anatomic noise, superimposition, geometric distortion, and radiographic contrast.[69] To address these limitations, recent studies have explored the use of deep learning systems and artificial intelligence (AI) to potentially increase the accuracy of detecting mandibular fractures by panoramic x-ray.[69–71] Along with the rising applications of AI in the medical field, studies are currently aimed to incorporate AI in the automatic detection of mandibular fractures using deep learning systems such as the convolution neural network (CNN) leading to accurate and efficient diagnosis.[69–71] Furthermore, a 2026 survey among selected Filipino surgeons showed high knowledge scores and guideline consistent behaviors, demonstrating the use of panoramic x-ray as an initial imaging modality in ruling out mandibular fractures.[19] This study further supports the relevance of panoramic x-ray in the current practice in the management of mandibular body fractures and highlights its utility among surgeons especially when CT is unavailable.[19]

STATEMENT 3. RADIOGRAPHS: In a setting where panoramic radiography is not available, clinicians may recommend plain mandibular radiography among patients with presumptive clinical diagnosis of mandibular fracture. *Recommendation*.

Grade C Recommendation, Level III

Action Statement Profile for Statement 3

- Aggregate Evidence Quality: Grade C, Level III
- Benefit: Plain mandibular series have comparable sensitivity and specificity to panoramic x-rays in detection of mandibular fractures. They are also widely available compared to other imaging modalities.
- Risks, harms, costs: Plain mandibular series may have less diagnostic accuracy than panoramic x-rays and CT scans due to superimposition of bony structures and confusing spatial relationships. Exposure to radiation is also higher versus panoramic x-rays (< 6 uSv vs. 2.7-24.3 µSv), but much lower than CT scans (280 - 1410 µSv). The cost of standard mandibular radiographs is around PhP 200.00-900.00 in government hospitals and around PhP 981.00 -2670.00 in private hospitals.
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgements: The group concurs that CT scans are the imaging gold standard for evaluating mandibular fractures. However, due to CT scan higher costs, panoramic x-rays are considered the best initial imaging modality for evaluating mandibular body fractures. Since panoramic x-rays are not widely available locally, plain mandibular series are deemed sufficient based on aggregate evidence and the action statement profile, which recommends it as the next best imaging modality after panoramic x-rays in the context of low- and middle-income patients. Plain mandibular series are widely available, affordable and have comparable sensitivity to panoramic x-rays and CT scans.
- Intentional vagueness: None
- Role of patient preferences: Moderate; patients may opt for CT Scans instead of plain mandibular series if they can afford CT scans.
- Exceptions: No absolute contraindication. Inability to position the head properly may constitute a relative contraindication.
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

GUIDELINE SUPPORTING TEXT

Six (6) articles were reviewed for this statement: one (1) clinical guideline, four (4) cross sectional studies, and one (1) narrative review.

Plain mandibular series are a good screening examination among

patients with suspected mandibular fractures since they are accurate, widely available and affordable compared to other modalities.[72,73] One disadvantage of the mandibular series is being limited by its 2-dimensional view. It may miss fractures of different sites of the mandible, except the ramus, due to the superimposition of bony structures and the confusing spatial relationships of one segment to the other.[61] The limitation, however, may be reduced by taking multiple radiographic views (postero-anterior, lateral oblique, and reverse Towne's).[60,61,73] The combination and simultaneous correlation of these films may be used to confirm a possible fracture in the mandible. In comparison with other imaging modalities such as panoramic radiography and computed tomography, plain mandibular series ranks second after coronal computed tomography in terms of accuracy in the detection of fractures of the mandible, followed by panoramic radiography and axial computed tomography.[74]

CURRENT GUIDELINE SUPPORTING TEXT

Five (5) additional studies were reviewed in this update consisting of one (1) diagnostic accuracy study, one (1) cross-sectional study, and three (3) narrative reviews.

The updated evidence consistently supports the role of plain mandibular radiography as an alternative imaging modality in evaluating presumptive mandibular fracture, in the absence of a panoramic x-ray. New studies have also explored the possible role of artificial intelligence in supplementing its utilization in mandibular fracture detection.

In the presence of a presumptive diagnosis of mandibular fracture, plain mandibular series consisting of posteroanterior (PA), lateral, oblique, and reverse Towne's views may be considered alternatives to panoramic radiography and computed tomography (CT).[66,75–77] The main advantage of plain mandibular radiography is its widespread availability and lower cost compared to other modalities.[76] However, it may miss fractures of different sites of the mandible due to the superimposition of bony structures and the confusing spatial relationships of one segment to the other.[75]

Hence, different views are recommended to view the different sites of the mandible. A PA view accurately details fractures of the ramus, angle and body, but the condyles and symphysis are superimposed with the cervical spine and mastoid process respectively, and are displayed poorly.[66] Since this guideline is limited to the diagnosis of isolated mandibular body fractures, a PA view is enough to diagnose mandibular body fractures which can be further supplemented by lateral and oblique views.

Our original clinical practice guideline stated that a plain mandibular series ranks second to CT with regard to accuracy in detecting mandibular fractures, and is considered superior to panoramic x-ray.[74] However, recent studies have shown that panoramic x-rays have higher sensitivity (92%) compared to plain mandibular series (66%).[57] Controversy with regard to imaging sequence is also evident in the current practice on the management of mandibular fractures. In a recent KAP study among selected Filipino surgeons, only half correctly identified the imaging accuracy sequence (50.85%), with ORL-HNS specialists demonstrating higher knowledge scores compared to other specialists.[19] Self-reported practice also differs among consultants and trainees with regards to initial imaging modality demonstrating panoramic radiographs being used by consultants more compared to residents in their practice.[19] This shows that knowledge and practice regarding imaging may vary among different specialties, consultants, and trainees. Nevertheless, plain mandibular series radiography is considered an alternative imaging modality when panoramic x-rays and CT scans are not available.

STATEMENT 4. COMPUTED TOMOGRAPHY: If available, non-contrast facial CT scans may be obtained for the assessment of mandibular fractures. *Recommendation.*

Grade C Recommendation, Level III

Action Statement Profile for Statement 4

- Aggregate Evidence Quality: Grade C, Level III
- Benefit: CT scans provide better imaging quality (identify number and anatomic location of mandibular fractures), provide more accurate details on fractures (extent, severity and degree of displacement of fractured segments), and decreased interpretation errors.
- Risks, harms, costs: CT scans pose a potential risk of unnecessary exposure to ionizing radiation. A maxillo-mandibular multislice CT (MSCT) (effective dose 280-1,410 µSv) has higher radiation exposure vs. panoramic x-ray (effective dose 2.7-24.3 µSv). Plain CT (PhP 3,000.00-19,435.00) is more expensive than plain radiographs (PhP 200.00-2,760.00) and panoramic x-rays (PhP 450.00-1,825.00).
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgements: There is an option for clinicians to request CT scans because of higher sensitivity and accuracy in diagnosing mandibular fractures. It is important to

adequately identify all fractures preoperatively to anticipate techniques that may or may not be applicable for a safe and optimal surgical procedure. Affordability may be an issue for patients.

- Intentional vagueness: Type of CT scan (multislice, CBCT) not specified; availability and affordability have to be considered.
- Role of patient preferences: Moderate; patients who cannot afford CT scans may request alternative imaging (room for negotiation).
- Exceptions: Pregnancy and lactation may be a relative contraindication.
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

GUIDELINE SUPPORTING TEXT

Twenty-one (21) articles were reviewed, including one (1) systematic review, one (1) practice guideline, three (3) diagnostic accuracy studies, two (2) cross-sectional studies, 1 retrospective case series, eleven (11) review articles, one (1) training manual, and one (1) case report.

The decision to use more advanced imaging modalities such as computed tomography (CT) or cone beam computed tomography (CBCT) to diagnose mandibular fractures should be decided after considering severity of the injury, structural superimposition, patient's functional restrictions, cost, availability, soft-tissue imaging requirements and the need for 3-dimensional views.[78]

Computed tomography is a better tool for more definitive diagnosis and treatment planning of complex maxillofacial structures than traditional radiographs. It can identify the number and anatomical location of mandibular fractures, provide more accurate details on the extent of fractures, severity of comminution and degree of displacement of the fragments. A CT scan is therefore reserved and more advantageous for patients with complex mandibular injuries and other concomitant injuries of the maxillofacial skeleton.[6,61,78–85]

Three-dimensional reconstruction can be done in conjunction as it provides better visualization of the position, displacement and comminution of bone fragments.[61,84,86–93] "The more complex the surgery, the more critical it is to have accurate CT data to minimize intraoperative risk and poor outcome".[94] The disadvantages of CT include its cost, lack of accessibility, and immediate availability. It may also produce significant artifacts – beam-hardening artifacts (bone, hardware, or dental amalgam) and motion artifacts (swallowing or phonation) that can obscure images. It also subjects the patient to high radiation exposure. As radiation has a cumulative effect on the human body, any reduction in exposure to radiation is considered beneficial.[87,94,95]

One advanced imaging modality that may be used as an alternative to CT is CBCT. One of the basic principles of SEDENTEXCT Guidelines for CBCT stated it "should only be used when the question for which imaging is required cannot be answered adequately by lower dose conventional (traditional) radiography".[96]

Cone beam CT increases diagnostic certainty to 90.5% in patients with suspected mandibular fractures. It provides additional fracture detection and leads to a change in the treatment plan in 9.52% of sites compared to plain radiographs.[79] It has reduced radiation exposure time and consequently reduced radiation exposure for patients. Another advantage is the different display modes unique to maxillofacial imaging, and smaller size and cost than conventional CT scans.[94,95]

Although several studies have shown the diagnostic efficacy of CBCT in mandibular fractures, it has not yet been recommended as the primary diagnostic tool to use in a person suspected with multiple, severe facial injuries due to its limitations in soft tissue contrast. Unlike CBCT, CT may show the relations of a bone fragment and the adjacent muscle, bleeding, and existence of some foreign bodies in a traumatic injury. Cone beam CT may be recommended as an alternative to CT scans for ambulatory patients without loss of consciousness who have suspected mandibular fractures.[93]

CURRENT GUIDELINE SUPPORTING TEXT

This update reviewed nine (9) additional studies consisting of two (2) diagnostic accuracy studies, two (2) cross sectional studies, one (1) retrospective case series, and four (4) narrative reviews.

The evidence in this current update further supports the important role of non-contrast facial computed tomography (CT) scans in the assessment of mandibular fractures. Recent studies have also explored the use of artificial intelligence (AI) in the CT scan assessment of fractures.

Computed tomography scans are still considered the gold standard for diagnosing mandibular fractures.[57,71,97,98] They show the highest sensitivity (100%) in detecting mandibular fractures compared to other modalities such as panoramic x-ray and plain mandibular radiographs.[57,71] They are an indispensable tool in the precise

assessment of fractures providing multiplanar reformats and three-dimensional reconstructions that improve diagnostic assessment and management planning for facial trauma in general.[57,71,77,97,99–101]

Along with the increasing application of artificial intelligence in the medical field, a recent study explored the possible application of deep learning systems and (AI) in diagnosing maxillofacial fractures and showed high utility of CT for automated detection/classification of maxillofacial fractures including the mandible.[102]

STATEMENT 5. IMMOBILIZATION: Isolated mandibular body fractures should be temporarily immobilized/splinted with a figure-of-eight bandage until definitive surgical management can be performed or while initiating transport during emergency situations. *Recommendation.*

Grade B Recommendation, Level II

Action Statement Profile for Statement 5

- Aggregate Evidence Quality: Grade B, Level II
- Benefit**:** Immobilization provides reduction of pain and prevention of further complications while waiting for definitive treatment.
- Risks, harms, costs**:** Undue pressure may affect the forehead and ears if the bandage is not properly applied.
- Benefit-harm assessment**:** Preponderance of benefit over harm.
- Value judgements**:** In general, the initial intervention for mandibular fractures is immobilization. This is necessary until definitive surgical management can be performed or while initiating transport during emergency situations. The reduction of pain and avoidance of further complications can improve the quality of life of patients with isolated mandibular body fractures. In developing countries, patients in low socioeconomic brackets who cannot undergo immediate surgical treatment may benefit from immobilization.
- Intentional vagueness**:** None
- Role of patient preference: None
- Exception**:** None
- Policy level**:** Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

PRACTICE TOOLS

Figure-of-eight (or Barton's) bandaging is performed using a 2-inch wide and 4-meter long elastic bandage. It is started by placing the initial roll of the bandage over the inion (tip of the external occipital protuberance) then passed over the right parietal bone, across the vertex, down the left side anterior to the ear, under the chin, up the right side anterior to the ear, across the vertex, and across the left parietal bone to the point of origin. A turn is now taken forward along the right side of the jaw to the chin, and backward along the left side of the jaw from the chin to the nape of the neck; repeating these turns, and pinning the points of junction. Barton's bandaging leaves the ear lying in an uncovered triangle. The bandage may be finished by circular turns around the forehead.[103]

GUIDELINE SUPPORTING TEXT

Six (6) articles were included in this review, composed of one (1) systematic review, one (1) quasi-experimental study, one (1) practice guideline, two (2) patents, and one (1) case report.

Immobilization has always been the mainstay of treatment for all types of fractures in general.[104–109] Literature reviews since the World War II era described the use of the Barton's bandage as a means for immobilization of the mandible. They noted that the benefits of immobilization in fractures included lessening of pain and prevention of further fracture displacement.[104–107]

CURRENT GUIDELINE SUPPORTING TEXT

Two (2) clinical practice guidelines, one (1) cross-sectional study and one (1) retrospective observational study were found to support the statement and were included in this update. One (1) systematic review was also included but downgraded to a lower level of evidence because its support for the statement was only by mention in the background information (and not part of analyzed results), similar to a narrative review.

The updated evidence further supports the use of immobilization as an initial management for mandibular fractures prior to definitive surgical treatment. Immobilization of mandibular fractures in the emergency setting is done using a figure-of-eight bandage. The purpose is to prevent further fracture displacement and lessen pain during transport from the site of injury to hospital setting.[110–112] A recent study stated that Barton's bandage along with a stay-wire maintained in patients when delay in definitive surgery were expected helped in decreasing pain and edema.[112] Furthermore, a recent systematic review mentioned that in high income countries, Barton's bandage is still considered one of the non-surgical options for mandibular fractures.[113] Although currently used as a means of immobilization,[112,113] it should not replace definitive surgical management for most displaced fractures.

A recent survey among surgeons in the Philippines showed high utility of Barton's bandage as an initial immobilization modality among surgeon respondents, demonstrating the clinical relevance of Barton's bandage in the current management of mandibular body fractures, consistent with our guideline.[19]

STATEMENT 6: PAIN MANAGEMENT: Clinicians should routinely evaluate pain in patients with isolated mandibular body fractures using a numerical rating pain scale or visual pain analog scale. Analgesics should be routinely offered to patients with numerical rating pain scale score or VAS of at least 4/10. Patients may be initially managed with paracetamol and a mild opioid with or without an adjuvant analgesic. Reassessment should be given until the numerical rating pain scale score or VAS is 3/10 at most. *Strong recommendation.*

Grade A Recommendation, Level I

Action Statement Profile for Statement 6

- Aggregate Evidence Quality: Grade A, Level I
- Benefit: Adequate analgesia alleviates pain.
- Risks, harms, costs: Patients with allergies to analgesics may need alternative treatment.
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgements: Patients who are adequately immobilized usually do not present with significant pain. Pain is also dependent on a patient's threshold, so there is a need for a numerical pain scale to better assess and control pain and comfort the patient. Based on our experience, local institutions and health care providers do not ensure proper assessment of fracture pain, nor do patients receive adequate pain management. Based on the WHO analgesic ladder, paracetamol, aspirin or any NSAID may be used to manage pain initially while a weak opioid may be given if pain management is inadequate. While the panel recognizes that parenteral and/or intramuscular routes may be more efficacious, we leave the administration route to the discretion of the healthcare provider.
- Intentional vagueness: The analgesics, dosage, duration and route, and non-pharmacologic management are not specified.
- Role of patient preference: Moderate; especially patients with allergies and previous adverse reactions to analgesics.
- Exceptions: Patients with allergies, tolerance and adverse reactions to analgesics; cognitive impairment.
- Policy level: Strong recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

GUIDELINE SUPPORTING TEXT

There were nine (9) articles used in this section: one (1) meta-analysis, two (2) guidelines, five (5) cross-sectional studies, and one (1) national care manual.

The practice guidelines and emergency protocols included in the formulation of this key action statement all state that a numerical pain rating scale or visual analogue scale is imperative in the initial assessment of patients with pain.[114–120] They may not necessarily be specific to mandibular fractures, but they reiterate the need for proper management of pain at the emergency room. Adequate analgesia for moderate pain, described as a numerical score of 4/10, is managed via the WHO analgesic ladder. This guideline states that patients should be initially managed with paracetamol plus a mild opioid with or without an additional analgesic until adequate analgesia is achieved.[121] There is room for improvement in the management of pain as evinced by our literature review which shows that hospitals vary in the way pain is managed, and that pain is usually overlooked once patients are seen at the emergency room.[116–120,122]

CURRENT GUIDELINE SUPPORTING TEXT

There were four (4) articles added to this update: three (3) clinical practice guidelines and one (1) narrative review.

Current evidence consistently recommends the use of standardized pain assessment tools such as the Numerical Rating Scale (NRS) or Visual Analogue Scale (VAS) in the initial evaluation and ongoing monitoring of patients with pain.[110,123] A pain score of ≥ 4/10 generally warrants pharmacologic intervention. [110,111,124]

Paracetamol remains the recommended first-line analgesic because of its efficacy and favorable safety profile, while moderate to severe pain should be managed using a multimodal analgesic approach combining opioids with non-opioid and adjuvant agents, consistent with the WHO analgesic ladder and current pain management guidelines.[111,123,124] Non-pharmacologic measures such as fracture stabilization, appropriate positioning, and cold therapy may further reduce pain and patient distress.[110,111]

Pain management should be reassessed regularly, ideally every 15–30 minutes, with treatment adjusted until adequate pain control is

achieved.[110,124] Despite established recommendations, studies continue to show variability and undertreatment of pain in emergency settings, highlighting the need for improved adherence to standardized pain management protocols.

STATEMENT 7: ANTIBIOTICS: Prophylactic antibiotics should be given to adult patients with isolated mandibular body fractures with concomitant mucosal or skin opening with or without direct visualization of bone fragments. In patients without mucosal or skin lacerations, prophylactic antibiotics can be given 1 hour prior to surgery and up to 24 hours postoperatively. Penicillin is the drug of choice while clindamycin may be used as an alternative for patients in whom penicillin is contraindicated. *Strong recommendation.*

Grade A Recommendation, Level I

Action Statement Profile for Statement 7

- Aggregate Evidence Quality: Grade A, Level I
- Benefit: Prophylactic antibiotics decrease the incidence of surgical wound infections and reduce morbidity.
- Risks, harms, costs: There are possible adverse reactions to antibiotics; patients with allergies will need alternative treatment.
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value Judgements: Prophylactic antibiotics should be given to patients with open mandibular body fractures. They have the benefit of reducing the incidence of surgical site and implant infections. In the setting of underdeveloped and developing countries where patients with mandibular fractures may have poor oral hygiene and less than optimal nutrition, prophylactic antibiotics are beneficial.
- Intentional vagueness: The dose, duration, and route of antibiotic administration are not specified.
- Role of patient preference: None
- Exception: Patients with hypersensitivity to clindamycin (as a substitute for penicillin) need alternative treatment.
- Policy level: Strong recommendation
- Differences in opinion: None
- Changes from 2021 guidelines: None

GUIDELINE SUPPORTING TEXT

There were sixteen (16) articles included in our review: four (4) clinical practice guidelines, three (3) systematic reviews, four (4) randomized controlled trials, and five (5) observational studies.

Antibiotic prophylaxis is indicated in patients with mandibular trauma accompanied by extensive oral laceration and/or skin laceration[125–132] and even without visualized mucosal lacerations or bone fragments, fractures in tooth-bearing regions are considered contaminated.[131–133] Prophylactic antibiotics reduce the incidence of surgical wound infection and therefore reduce morbidity of the patient. Antibiotics should be given immediately in the emergency room and extended up to one day after definitive management.[126,130,133–138] In cases of closed mandibular fractures, prophylactic antibiotics may be given one hour prior to the procedure and up to 24 hours post operatively.[126,127] Penicillin is the drug of choice while clindamycin can be given in cases where penicillin is contraindicated.[126,139,140] In support of the use of clindamycin as an alternative to penicillin, we included a guideline from the American Heart Association as infective endocarditis shares the same bacterial flora as the oral cavity.[140]

CURRENT GUIDELINE SUPPORTING TEXT

Ten (10) studies were added in this update consisting of one (1) systematic review and meta-analysis, three (3) systematic reviews, one (1) clinical practice guideline, two (2) retrospective cohort studies, two (2) cross-sectional studies, and one (1) clinical consensus.

Current evidence supports the selective use of prophylactic antibiotics in mandibular fractures, particularly in open, contaminated, or tooth-bearing fractures and in cases associated with oral or skin lacerations.[141] Moreover, evidence suggests that prolonged antibiotic use offers little additional benefit and may contribute to antimicrobial resistance and other complications.[142–144] International guidelines recommend limiting prophylactic antibiotics to the perioperative period and up to 24 hours after definitive management, as extended courses have not been shown to significantly reduce infection, osteomyelitis, or revision rates.[142,143,145–147]

Penicillin remains the preferred first-line antibiotic, while clindamycin is an appropriate alternative in patients with penicillin allergy.[141,148–150] Surveys and observational studies further show that prophylactic antibiotics are still widely prescribed in clinical practice, although substantial variation exists in antibiotic selection, timing, and duration, reflecting the continued lack of universal consensus and the need for standardized evidence-based protocols.[141,148,149]

STATEMENT 8: ANESTHESIA: Nasotracheal intubation is the preferred route of anesthesia in patients diagnosed with isolated mandibular body fracture. In the presence of contraindications to nasotracheal intubation, submental intubation or tracheostomy may be performed. *Recommendation.*

Grade C Recommendation, Level III

Action Statement Profile for Statement 8

- Aggregate Evidence Quality: Grade C, Level III
- Benefit: Appropriate anesthetic routes facilitate adequate reduction, establishment of occlusion and aid maxillomandibular fixation.
- Risks, harms, costs: There are risks in patients who have undergone nasal surgery and those with skull base and cervical fractures. Epistaxis may arise due to trauma. There is also the need for an experienced anesthesiologist and the use of Magill forceps; an armored tube is necessary for those undergoing submental intubation, and a tracheostomy tube is needed for those undergoing tracheostomy.
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgement: The need for free manipulation of the mandible for adequate reduction and fixation can be best achieved if there is no oral obstruction; the airway is more secure when a nasotracheal route is used. Alternative means of airway access may be used in special cases such as when complex facial fractures are present. Submental intubation or tracheotomy should be considered in patients with massive craniofacial injury and in those who are expected to be intubated for more than 5 days.
- Intentional vagueness: The choice between submental intubation and tracheostomy as an alternative to nasotracheal intubation is dependent on the operator's skill and training.
- Role of patient preference: None
- Exceptions: None
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

GUIDELINE SUPPORTING TEXT

There were twelve (12) articles included in our original review: six (6) narrative review articles, four (4) cross-sectional studies, one (1) case series, and one (1) case report.

Nasotracheal intubation is widely used in maxillofacial surgery.[151–155] Submental intubation is a safe alternative to tracheostomy for those not requiring prolonged ventilation.[156–160] The review of literature recommends the use of nasotracheal intubation as the standard in managing patients with facial trauma wherein manipulation of the jaw and establishment of occlusion is necessary.[151–158,160–162]

CURRENT GUIDELINE SUPPORTING TEXT

Five (5) studies were included in this update, consisting of one (1) prospective comparative study, three (3) narrative reviews, and one (1) educational review.

No new studies were categorized as Level I for this statement, but there was one Level II study, [163] with four of the studies having Level V evidence[164–167] that strongly support nasotracheal intubation as the standard airway management technique in maxillofacial surgery, particularly in procedures requiring mandibular manipulation, establishment of occlusion and unobstructed surgical field. However, it may be difficult or contraindicated in patients with facial trauma, skull base fracture, coagulopathy, nasal bone fracture, epistaxis, or nasal pathology.[166,167] In situations where nasotracheal intubation is contraindicated, submental intubation and tracheostomy are still recommended as alternatives.[163,164,167]

Submental intubation is a safe and reliable alternative to tracheostomy in patients not requiring prolonged ventilation, especially in complex facial trauma where both oral and nasal access are needed. It is associated with lower morbidity and is generally simple and well tolerated.[163–165,167] Tracheostomy remains indicated when prolonged airway support or repeated surgical intervention is necessary.[166] Overall, current evidence supports nasotracheal intubation as first-line management, with submental intubation serving as an effective alternative in selected complex cases.[163,164,167]

STATEMENT 9: OBSERVATION: Observation with soft diet may serve as management for patients diagnosed with favorable isolated nondisplaced and nonmobile mandibular body fractures with unchanged pre - traumatic occlusion. *Recommendation.*

Grade B Recommendation, Level II

Action Statement Profile for Statement 9

- Aggregate Evidence Quality: Grade B, Level II
- Benefit: Observation and conservative management may achieve satisfactory healing and acceptable quality of life. Cost-effectiveness and avoidance of unnecessary surgery and surgical pain and stress are primary advantages.
- Risks, harms, costs: Observation may entail frequent clinical follow up and added cost of serial radiographs and may present challenges related to eating, speaking, oral hygiene, and patient comfort.
- Benefit-harm assessment: Preponderance of benefit over harm.

- Value judgements: Non-surgical interventions including observation and soft diet have proven beneficial in non-displaced mandibular body fractures in terms of morbidity and cost, and serve as an option for uncomplicated cases. Observation accompanied by a soft diet is an adequate management of favorable isolated nondisplaced and nonmobile mandibular body fractures. It is not costly and avoids unnecessary surgical procedures.
- Intentional vagueness: The duration of observation with soft diet is not specified. The basis for conversion to other forms of management is not included either.
- Role of patient preference: None
- Exception: None
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

GUIDELINE SUPPORTING TEXT

There were four (4) studies originally reviewed, two (2) cross-sectional studies and two (2) prospective cohort studies, all showing that patients with favorable isolated nondisplaced nonmobile body of mandibular fractures managed with observation on a soft diet had spontaneous healing of fractures and had no complications.[34,168–170]

CURRENT GUIDELINE SUPPORTING TEXT

Only one (1) Level IV study was added to this update, with no new studies categorized as Level I or II. The newly-added retrospective case series further supports non-surgical management for selected patients with nondisplaced or minimally displaced fractures, particularly when occlusion remains normal and the patient is reliable and compliant with follow-up instructions.[171] Conservative treatment commonly includes observation, soft diet, analgesia, and close clinical follow-up.

STATEMENT 10: CLOSED REDUCTION: Closed reduction with immobilization by maxillomandibular fixation for 4-6 weeks may be considered in patients with minimally displaced favorable isolated mandibular body fracture with stable dentition, good nutrition and who are willing to comply with post-procedure care that may affect oral hygiene, diet modifications, appearance, oral health and functional concerns (eating, swallowing and speech). *Recommendation.*

Grade B Recommendation, Level II

Action Statement Profile for Statement 10

- Aggregate Evidence Quality: Grade B, Level II
- Benefit: Closed reduction with immobilization may restore preoperative stable occlusion, promote good fracture healing, and is simpler, faster, cheaper, and less painful than open reduction.
- Risks, harms, costs: Prolonged intermaxillary fixation may be contraindicated in patients with psychiatric disease, seizure disorders, pulmonary disease, or gastrointestinal disorders because of aspiration concerns. It is also contraindicated in medically unstable patients who cannot tolerate/comply with immobilization with MMF, those with poor nutrition and/or unstable dentition near the fracture site.
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgements: Although maxillomandibular fixation (MMF) is less invasive and is associated with lower pain and cost, patient nutrition and quality of life may be affected over the duration of treatment. Closed reduction with immobilization may be the most appropriate course of action in selected cases, provided optimal conditions for this form of management are met.
- Intentional vagueness: The type of MMF is not specified.
- Role of patient preference: Small
- Exception: Medically unstable patients who cannot tolerate/comply with immobilization with MMF (e.g., psychiatric disease, seizure disorders, pulmonary disease, or gastrointestinal disorders); poor nutrition; unstable dentition near the fracture site.
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

GUIDELINE SUPPORTING TEXT

Based on our original review of ten (10) articles: one (1) meta-analysis, two (2) randomized controlled trials, three (3) prospective cohort studies, one (1) retrospective cohort study, one (1) narrative review article, one (1) book chapter, and one (1) algorithm; most cases of isolated minimally displaced mandibular body fractures that underwent closed reduction with maxillomandibular fixation achieved healing and union.[8,65,170,172–178]

Closed reduction with MMF is simpler, faster, cheaper and less painful than open reduction techniques.[65,170,173,178] Important prerequisites to achieve good occlusion and better healing include the presence of stable dentition and good nutrition. However, the level of evidence for studies supporting this statement was grade

B at most, and higher level evidence is still needed to recommend whether to manage patients with closed reduction or open reduction.[8] In comparison to open reduction techniques, closed reduction with maxillomandibular fixation seemed to be simpler, associated with lower pain and cost.[65,170,173,178] However, plaque occurrence, poor oral hygiene, maintenance, worries in appearance and functionality were some of the disadvantages associated with closed reduction with MMF.[175–177]

CURRENT GUIDELINE SUPPORTING TEXT

Three (3) studies added to this update, consisting of one (1) systematic review and meta-analysis, one (1) systematic review, and one (1) narrative review still support closed reduction as the preferred management for simple or minimally displaced mandibular fractures when stable and reproducible occlusion can be maintained.

The technique commonly involves the application of Erich arch bars with MMF using wires or elastics.[66] Closed reduction typically requires 4–6 weeks of jaw immobilization, which may present challenges related to eating, speaking, oral hygiene, and patient comfort.[66,179] Prolonged intermaxillary fixation may be contraindicated in patients with psychiatric disease, seizure disorders, pulmonary disease, or gastrointestinal disorders because of aspiration concerns.[66] Patient selection and fracture characteristics are important determinants of treatment choice.[179]

Alternative fixation methods such as intermaxillary fixation (IMF) screws may reduce operative time and simplify application; however, these may provide less stable fixation over prolonged periods and are associated with complications such as screw loosening, screw fracture, tooth root injury, and tooth mobility, potentially compromising dental stability.[180]

STATEMENT 11. OPEN REDUCTION WITH TITANIUM PLATES: Open reduction internal fixation using titanium plates and screws should be performed in isolated displaced unfavorable and unstable mandibular body fractures. *Recommendation.*

Grade B Recommendation, Level II

Action Statement Profile for Statement 11

- Aggregate Evidence Quality: Grade B, Level II
- Benefit: ORIF with titanium plates achieves better and more stable fixation; reduces workdays lost; avoids or reduces postoperative IMF duration, shortens hospital stay and allows early restoration of normal function.
- Risks, harms, costs: ORIF with titanium plates is more expensive than other treatments.
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgements: Displaced, unfavorable and unstable mandibular body fractures require fixation that titanium plates can best provide, allowing more stable fixation and assuring early restoration of normal form and function with lower overall costs for the patient and shorter hospital stay, faster recovery and minimal effects on daily living.
- Intentional vagueness: The type of titanium plate is not specified; the approach (intra- or extra-oral) is not specified either, recognizing variations in fracture duration (fresh or neglected), surgeon preference and the need for appropriate instrumentation.
- Role of patient preference: Small
- Exception: When medical illness or systemic injury add undue risk to an extended general anesthetic.
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: The original statement 12 is now statement 11.

GUIDELINE SUPPORTING TEXT

Three (3) studies reviewed–one (1) randomized controlled trial, one (1) quasi-experimental study, and one (1) retrospective cohort study showed that the use of bone plates assures early restoration of normal form and function, compared to intraosseous wiring which was associated with extended periods of maxillomandibular immobilization.[181,182]

Overall cost and charges associated with treating mandibular fractures with ORIF, such as operating room time and expenses, hardware charges, charges related to overall hospital length of stay and charges related to treatment complications, and loss of income due to absence from work are significantly lower when titanium plates are used.[182,183] Patients who underwent ORIF with titanium plates and screws regained confidence faster by not being conscious of the awkward looking dental wiring used for immobilization.[182] Furthermore, maxillomandibular immobilization is not essential post-operatively after internal fixation with titanium plates.[181]

CURRENT GUIDELINE SUPPORTING TEXT

This update reviewed two (2) additional studies consisting of one (1) comprehensive systematic review and one (1) narrative review.

Open reduction internal fixation (ORIF) is still the preferred method for treating the majority of displaced mandibular fractures. Transoral miniplates may be used to achieve semi-rigid fixation in cases of uncomplicated, non-displaced fractures.[184] The standard of care for management of most displaced mandibular injuries is open reduction internal fixation (ORIF) that can be achieved using a variety of techniques. Semi-rigid fixation using miniplates can be applied in simple, non-displaced fractures.[66]

STATEMENT 12. OPEN REDUCTION WITH TRANSOSSEOUS WIRING: In patients with isolated displaced unfavorable and unstable mandibular body fracture who cannot afford or avail of titanium plates, transosseous wiring with maxillomandibular fixation is an option. *Recommendation.*

Grade B Recommendation, Level II

Action Statement Profile for Statement 12

- Aggregate Evidence Quality: Grade B, Level II
- Benefit: Open reduction with transosseous wiring achieves comparable outcomes and costs less than titanium plates.
- Risks, harms, costs: ORIF with transosseous wiring may have relatively increased morbidity in terms of surgical malocclusion, delayed union, higher infection rates and mental nerve injury; wider fracture gap post-operatively; and delayed restoration of function.
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgements: ORIF with transosseous wiring is another form of management in place of traditional plating methods. However, it is associated with higher infection rates, postoperative malocclusion and mental nerve injury. The panel recognizes that ORIF with titanium plates is a superior method of fixation over transosseous wiring, but it may be too expensive for resource-challenged patients and settings. Although the initial costs of titanium plates may seem more expensive than transosseous wiring, the cost of managing complications of transosseous wiring may be more expensive in the long term. However, real-life situations and resources must be considered in deciding on the course of action. While the panel recognizes the superiority of titanium plates, the group also recognizes that not all patients can afford it. The delays in surgery in such cases may lead to surgical and technical difficulties, making early establishment of treatment using transosseous wires an option.
- Intentional vagueness: The type of wire and wiring technique and duration of MMF are not specified.
- Role of patient preference: Small
- Exception: When advanced age, medical illness or systemic injury add undue risk to an extended general anesthesia.
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: The original statement 11 is now statement 12.

GUIDELINE SUPPORTING TEXT

Based on our review of five (5) articles–one (1) randomized controlled trial, two (2) cohort studies, one (1) quasi-experimental study, and one (1) cross-sectional study, the use of transosseous wiring with maxillomandibular fixation remains an option in the treatment of isolated displaced unfavorable and unstable mandibular body fractures in patients who are financially constrained.

Although it provides less stable fixation as shown by having a greater gap at the fractured ends at 3 months post-op, it is comparable to titanium fixation systems in terms of achieving the correct post-operative occlusion, eventual fracture healing and complication rate.[181,182,185,186]

The purpose of this statement is to address the need for reasonable treatment options for financially constrained patients with mandibular fractures. It has been observed that many of these patients have a delay in the treatment of their condition and several days delay will lead to technical difficulties and a higher complication rate in terms of healing and achieving proper occlusion.[185,187]

CURRENT GUIDELINE SUPPORTING TEXT

Two (2) additional studies were included in this update, consisting of one (1) randomized controlled-trial and one (1) biomechanical experimental cadaveric study. Although these studies dealt with the parasymphysis and/or angle instead of the body, they were considered because they compared transosseous or interosseous wiring with plate fixation.

This update highlights recent evidence that supports the continued use of transosseous/intraosseous wiring with maxillomandibular fixation as a viable option in selected or resource-limited settings when titanium plates are unavailable.[188,189]

Although graded as Level V, the biomechanical study with experimentally created mandibular angle and parasymphyseal fractures

in cadaveric mandibles supports the concept that transosseous/interosseous wiring with maxillomandibular fixation may serve as an alternative fixation option.[188] A Level II RCT from a resource-limited setting found that transosseous wiring produced acceptable outcomes in many patients, although miniplates were associated with shorter operative time and fewer complications; nevertheless, wiring remains a reasonable option when plating is not available.[189]

STATEMENT 13. MAXILLOMANDIBULAR FIXATION: Intraoperative maxillomandibular fixation may not be routinely needed prior to reduction and internal fixation of isolated displaced unfavorable and unstable mandibular body fracture. In selected cases manual anatomical reduction may suffice. *Recommendation.*

Grade B Recommendation, Level II

Action Statement Profile for Statement 13

- Aggregate Evidence Quality: Grade B, Level II
- Benefits: Manual anatomical reduction may shorten operative time and achieve comparable occlusal outcomes with lower costs and less risk of blood-borne diseases for patients and surgeons.
- Risks, harms, costs: Manual anatomical reduction may result in malocclusion. Success is highly dependent on the experience and skill of the surgeon.
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgements: The panel recognizes that in the treatment of isolated displaced unfavorable and unstable mandibular body fractures, establishment of proper occlusion is essential. The panel concedes that use of intra-operative MMF may not be routinely done by a skilled surgeon, and intraoperative manual anatomic reduction may be performed instead prior to plate fixation. Additional supportive evidence prompts the panel to add the sentence that: "In selected cases manual anatomical reduction may suffice" to this Key Action Statement.
- Intentional vagueness: The method of manual anatomic reduction is not specified.
- Role of patient preferences: None
- Exceptions: When medical illness or systemic injury add undue risk to an extended general anesthesia.
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: The sentence "In selected cases manual anatomical reduction may suffice" was added to the original Key Action Statement.

GUIDELINE SUPPORTING TEXT

The purpose of this statement is to emphasize that restoration of the premorbid occlusion is essential to the treatment of mandibular fracture. However, it also concedes that in skilled hands, maintenance of proper occlusion can be achieved by manual reduction based on three (3) articles that we reviewed, two (2) randomized controlled trials and one (1) retrospective cohort study.[190–192]

This method of open reduction has economic benefits: faster operation time and cheaper total cost.[190–192] It is also safer for both the patient and the surgical team due to decreased associated injuries and blood-borne disease transmission.[190–192] For the patient, manual reduction is associated with decreased discomfort and has similar occlusal outcomes in the early postoperative period with earlier return of function.[190]

CURRENT GUIDELINE SUPPORTING TEXT

Two (2) additional studies were included in this update consisting of one (1) systematic review and one (1) multi-center prospective study.

The systematic review done in Nepal demonstrated that manual intraoperative control of occlusion during fixation of mandibular fractures achieves occlusion and anatomical reduction, with a lower incidence of inadequate reduction, occlusal disturbance, and need for revision procedures to correct deformity.[193] The prospective study involving twelve European centers found no statistically significant difference in postoperative malocclusion rates or infective complications between manual and rigid maxillomandibular fixation (MMF), suggesting that both manual and rigid MMF are equally effective for intraoperative stabilization.[194] Our additional supporting evidence suggests that surgeons can achieve accurate fracture reduction and stable occlusion without the routine use of intraoperative MMF, especially in cases of mandibular fractures.[193,194] Thus, we are adding the sentence "In selected cases manual anatomical reduction may suffice" to our original Key Action Statement.

STATEMENT 14. PREVENTION: Clinicians should advocate for compliance with road traffic safety laws (speed limit, anti-drunk driving, seatbelt and helmet use) for the prevention of motor vehicle, cycling and pedestrian accidents and maxillofacial injuries. *Strong Recommendation.*

Grade A Recommendation, Level I

Action Statement Profile for Statement 14

- Aggregate Evidence Quality: Grade A, Level I

- Benefit: Clinician-advocated appropriate preventive measures can help prevent accidents and maxillofacial injuries.
- Risks, harms, costs: Advocating compliance with road traffic safety laws requires clinicians to work beyond their role in diagnosis and management, entailing time and cost of educational materials.
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgements: The panel recognizes the need for increased public awareness regarding traffic laws, mandating helmet/seatbelt use and avoidance of alcohol intake when driving, and agrees that implementation of these policies significantly reduces the incidence of road traffic accidents and violent crime in general and consequently, the reduction of mandibular trauma.
- Intentional vagueness: The advocacy details, type of helmet (modular, full face) and other details (tail lights, other safety precautions) are not specified.
- Role of patient preferences: None
- Exceptions: None
- Policy level: Strong recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

GUIDELINE SUPPORTING TEXT

The review of fourteen (14) articles– two (2) systematic reviews, one (1) prospective cohort, ten (10) cross-sectional studies, and one (1) narrative review article shows road traffic accidents and assaults are the most common causes of mandibular fractures.[28,40,195]

Several factors contribute to the prevalence of road traffic accidents, particularly alcohol consumption. Motorists under the influence of alcohol have a higher likelihood of injury or are more likely to be involved in trauma. Alcohol intoxication is associated with interpersonal violence and correlates with the severity of mandibular fractures.[196–201] Helmet use was only found in a minority of injured motorcyclists, among whom maxillofacial involvement was seen in the majority.[196]

Preventive practices (i.e., mandatory use of seat belts and helmets) likewise reduce the risk for mortality and head and neck injuries following vehicular accidents.[202,203] The Land Transportation and Code,[204] Motorcycle Helmet Act of 2009,[205] Seat Belts Use Act of 1999,[206] and Anti-Drunk and Drugged Driving Act of 2013,[207] are Philippine laws drafted to protect individual and public safety. Similar laws are also present in other countries and have been proven effective to decrease incidence and severity of maxillofacial injuries.[23] The extremely low percentages of road traffic accidents in most European countries could be associated with strict adherence to road traffic laws and implementation of preventive practices like mandatory use of seat belts, air bags and helmet, setting of speed limits, and strict policies against alcohol consumption and driving.[208]

Health and medical professionals have an ethical responsibility to educate and arrange for the safety of individuals.[209] Efforts to educate and promote road safety especially among young adults are warranted.[5] Efforts to protect those who are exposed to the risk of road traffic accidents are also warranted. Collaboration with different sectors involved in collecting and reporting road traffic injury data should be encouraged.[200,210]

CURRENT GUIDELINE SUPPORTING TEXT

Four (4) additional studies were included in this update consisting of one (1) retrospective multi-database review, two (2) retrospective cross-sectional studies and one (1) retrospective descriptive study.

The retrospective multi-database review highlights how traffic legislation plays a crucial role in reducing maxillofacial injuries, and strongly reinforces the idea that road safety is not just a medical issue but a policy and enforcement issue as well. This study underscores the importance of integrating strong governance, education, and behavioral change to truly improve road safety outcomes.[211] Road traffic accidents (RTAs) remain the predominant cause of mandibular fractures, particularly among young adult males in Bangladesh and Ghana, suggesting that traffic safety interventions are central to prevention.[212,213] In Bangladesh, RTAs accounted for the majority of mandibular trauma cases, underscoring the need for enhanced public education on safe driving and enforcement of road safety regulations.[212] A study in a tertiary hospital in Karachi found that RTAs remain a leading etiology of mandibular fractures, pointing to the importance of helmet and seatbelt use, traffic law enforcement, community awareness programs, talks and seminars to develop driving sense and to reduce mandibular trauma incidence.[214] In the same way, a study done in Ghana identified motor vehicular accidents as the most common cause of mandibular fracture. The higher incidence of nighttime motor vehicular accidents was attributed to poor road lighting.[213] It was suggested that this modifiable risk factor be resolved by emphasizing infrastructure improvements alongside behavioral prevention strategies.[213] Strong implementation of traffic rules and strict vehicle driving regulations is highly recommended.

STATEMENT 15. PROMOTION: Clinicians should play a positive role in the prevention of interpersonal and collective violence as well as the settings in which violence occurs in order to avoid injuries in general and mandibular fractures in particular. *Recommendation.*

Grade C Recommendation, Level III

Action Statement Profile for Statement 15

- Aggregate Evidence Quality: Grade C, Level III
- Benefit: Positive health promotion in preventing violence and the settings in which it occurs can avoid injuries in general and maxillofacial injuries in particular.
- Risks, harms, costs: None
- Benefit-harm assessment: Preponderance of benefit over harm.
- Value judgements: The panel recognizes the important role of health care providers in promoting health and preventing disease.
- Intentional vagueness: The manner by which clinicians play their role in health promotion and the prevention of interpersonal and collective violence as well as the settings in which violence occurs is left to their discretion.
- Role of patient preference: None
- Exception: None
- Policy level: Recommendation
- Differences of opinion: None
- Changes from 2021 guidelines: None

GUIDELINE SUPPORTING TEXT

The seven (7) articles reviewed were composed of six (6) cross-sectional studies and one (1) narrative review article.

Another main cause of maxillofacial fractures is interpersonal violence.[215,216] "The World Health Organization has defined interpersonal violence (IPV) as violence committed by an individual or a small group of individuals and includes physical and sexual assault, emotional and psychological abuse, and neglect."[200] Young male adults were the most affected demographic group, with alcohol as a main contributing factor.[5,196,201]

It was found that mandible fractures are common following interpersonal violence, and often cited as one of the most common fractures following assault.[217] Thus, health professionals have an important role in community violence prevention to increase public safety[200,210] and oral and maxillofacial surgeons who typically treat patients with facial injuries are in a good position to institute necessary rehabilitation process, as well as preventive programs.[200] The majority of people consulting at the emergency department for facial trauma due to interpersonal violence are in the contemplation or the preparation stage of behavior change. Given these results, it may be beneficial to develop violence reduction programs within emergency departments.[215]

Injuries are preventable by changing the environment, individual behavior, product, social norms, legislation and governmental and institutional policies to reduce or eliminate risks and increase protective factors. Violence-related facial fractures are a health hazard that deserves more public awareness and implementation of preventive programs. Health professionals need to be aware of their important role in prevention, and preventive measures have to be disseminated effectively.[200,210,215,217]

CURRENT GUIDELINE SUPPORTING TEXT

This update reviewed four (4) additional studies consisting of one (1) retrospective observational study, two (2) retrospective cross-sectional studies, and one (1) narrative review.

While clinical management of mandibular fractures is well established, prevention remains a multifaceted challenge. A retrospective study in a Southern European Level I Trauma Center examined patterns in facial fractures resulting from interpersonal violence over twelve years and found the mandible was the most frequently fractured bone among assault victims (42% of cases). The incidence remained stable, underscoring ongoing societal risk factors such as violence exposure. The authors emphasize targeted prevention programs, early intervention, standardized treatment protocols, and multidisciplinary approaches are essential to reduce the incidence of interpersonal violence-related trauma.[218] Prevention is framed within broader public health strategies addressing underlying causes such as alcohol use and socioeconomic contributors to aggression. A study from Mexico City suggests preventive measures to focus on reducing violent encounters and addressing demographic risk patterns to lower mandibular fracture rates.[219] A retrospective cohort study recommended that education campaigns to reduce alcohol consumption, legislative measures to curb violence, and social support for at-risk populations could help prevent mandibular fractures related to aggression.[58] The critical role of public health preventive strategies—such as seat belt and helmet legislation, violence prevention programs, and occupational safety regulations—to reduce the incidence and severity of maxillofacial and mandibular fractures globally was discussed in a comprehensive narrative review.[220] This study stated

that this issue requires a multifaceted approach that encompasses improved prevention strategies, enhanced access to specialized care, and the development of innovative treatment modalities to reduce trauma incidence.[220]

In addition, the Department of Transportation (DOTr) created the Philippine Road Safety Action Plan (PRSAP) 2023–2028 which embodies the government's national strategy to reduce road traffic deaths by at least 35% by 2028 through a "safe system" approach.[221] It focuses on five key areas: 1. improving road safety management and coordination; 2. building safer road infrastructure; 3. ensuring vehicles meet safety standards; 4. promoting responsible behavior among road users through education and law enforcement; and 5. strengthening emergency response and post-crash care.[221] The PRSAP is primarily based on public health policy recommendations, expert opinion, and preventive health frameworks rather than randomized controlled trials or systematic reviews directly evaluating mandibular fracture prevention.[221] The available evidence emphasizes the role of multi-sectoral injury prevention strategies and clinician participation in violence and injury prevention programs. The key action statement is supported because the literature and policy documents recognize that: 1. road traffic injuries and violence-related injuries are major public health concerns associated with facial trauma and mandibular fractures; 2. injury prevention strategies such as education, safer environments, law enforcement, community interventions, and public health promotion are essential to reduce trauma incidence; and 3. healthcare professionals and institutions are encouraged to participate in advocacy, education, trauma prevention, and post-crash response initiatives.

ANNOTATED EVIDENCE, PREVIOUS AND CURRENT, BY KEY ACTION STATEMENT

KAS 1 Previous Evidence:

Level I. A meta-analysis of 269 papers on the utility of the tongue blade test for the diagnosis of mandibular fracture by investigators from Manchester, UK. Two diagnostic studies with best evidence reported high sensitivity (95.7 and 95%) of the tongue blade test as a useful screening tool in evaluating patients with mandibular fractures.[51]

Level II. A retrospective cohort study by the University of Pittsburgh, PA, USA from 2001 to 2005 involving a total of 13,142 patients showed "assault was the predominant mechanism of injury (42%), followed by motor vehicle accidents (31%);" with "male preponderance... similar to overall age distribution".[22]

Level III. A cross-sectional study to evaluate the utility of the tongue blade bite test in predicting mandibular fracture in Louisiana, USA from 2011 to 2014. A chart review of 86 patients with facial trauma (with 12 pediatric patients) were included in the study. All subjects had a bite test done and underwent CT scan. The bite test revealed a sensitivity of 88.5%, specificity of 95%, positive predictive value of 88.5%, and negative predictive value of 95%. Among the pediatric group, the sensitivity was 100%, specificity was 88.9%, positive predictive value was 75% and negative predictive value was 100%.[54]

Level III. A double blinded diagnostic cross-sectional study of 57 subjects with facial trauma from the Stony Brook University Hospital, NY, USA who were included over a non-consecutive 4-month period from June 2013 to April 2014 aimed to assess the predictive value of physical examination findings in detecting facial fractures in trauma patients. Dental malocclusion (31.6%) and tenderness (35.1%) showed the best diagnostic properties and intraoral/gingival laceration (19.3%) showed relatively poor positive predictive value and sensitivity. The study concluded that physical examination findings of mandibular fractures have a 100% sensitivity rate and negative predictive value (but a low specificity of 71.4% and positive predictive value of 55.6%) in correlation to CT scan findings.[49]

Level III. A cross-sectional study done in Italy (UNITO) and the Netherlands (VUMC) between January 2001 and December 2010 included 752 patients from Turin and 245 patients from Amsterdam. Assault was the main cause of fractures with "27% at VUMC, 29% at UNITO". "A statistically significant association was found between male gender and the aetiology of 'assault' in both study populations". They also noted that "the most frequently observed sign in both study populations was post-traumatic malocclusion, followed by facial lacerations in the chin region and inferior alveolar nerve paresthesia".[27]

Level III. A cross-sectional study that reviewed records of 119 patients treated for mandibular fractures between 2006 and 2011 in Brazil revealed mandibular fractures mostly affect Caucasian (72.2%) men (80.7%). Road traffic accidents (RTA) caused the most fractures (49.5%), followed by physical violence, including gunshot wounds (21%). Motorcycle accidents were the most common cause of RTA (76.2%) and the most affected mandibular regions were the parasymphysis (26.9%) and the mandible angle (25.1%).[40]

Level III. A cross-sectional study on epidemiology and patterns of injury in mandibular trauma based on the Parkland Memorial Hospital, TX, USA registry yielded 4,143 mandibular fractures in 2,828 patients

between 1993-2010. The average age was 38 years with 33% in the third decade, 83.27% were male and most injuries occurred in summer (July highest). Mechanisms of injury were predominantly low-velocity blunt injuries (62%) vs. high-velocity blunt injuries (31%). Anatomical distribution of fractures was: angle (27%), symphysis (21.3%), condyle/subcondyle (18.4%), and body (16.8%).[39]

Level III. A cross-sectional study involving 768 patients in Shiraz Chamran Emergency Hospital, Iran between 2004 and 2010 observed that "isolated mandibular fracture due to road traffic accident was the most common type of maxillofacial injuries" and that the most common site of the mandible fractured was the body.[24]

Level III. A cross-sectional study of 790 cases of oral-maxillofacial trauma in Guanhães, Brazil found that 140 individuals (17.7%) had injuries stemming from interpersonal violence [(10.1%) due to urban violence and 42 (5.3%) due to domestic violence]. For urban violence, the most common types of injury were facial contusion and dental concussion (70; 87.5%), facial laceration (46; 57.5%), and mandibular fracture (26; 32.5%). For domestic violence, the most frequent types of injury were facial contusion (n = 41; 97.6%), facial laceration (16; 38.1%), and mandible fracture (10; 23.8%).[35]

Level III. A cross-sectional study of 266 patients with mandibular fractures in the University Hospital of Uppsala, Sweden from 1999-2008 revealed that 70% of fractures involved young men, aged 16 to 30 years old (50%). Interpersonal violence was the most common etiology (24%) followed by falls (23%) that had the highest incidence during the summertime and weekends.[44]

Level III. A cross-sectional study from August 1, 2010 to April 11, 2012 at a single urban academic emergency room in the Lincoln Medical and Mental Health Center, Bronx, NY, USA to determine the sensitivity and specificity of the tongue blade test in comparison with CT scan in 190 patients. The tongue blade test showed a sensitivity of 95% and specificity of 68%. The test also demonstrated an accuracy rate of 82% in this study.[53]

Level III. A cross-sectional study performed among 11,72 patients in the Universidade Estadual Paulista, Araraquara, SP, Brazil revealed that "the most frequent cause of maxillofacial injuries for both genders was traffic accidents (39.6%), followed by fights (21.6%). In women, the second most frequent cause was falls (22.4%)".[26]

Level III. A cross-sectional study in the Maria Amélia Lins Hospital in Belo Horizonte, Minas Gerais, Brazil from January 2000 to December 2002 showed that 2,736 of the patients had facial fractures, 1,023 (37.39%) of whom had mandibular fractures. "The major cause of mandibular fractures in this study was vehicle accidents, second most common was violence". "Gunshot wounds and traffic accidents were more common in males than in females. The opposite occurred with falls and violence."[31]

Level III. A cross-sectional study of records of 328 active military personnel and dependents treated for mandibular fractures at a tertiary military hospital in Quezon City, the Philippines showed varied causes: vehicular accidents (not work-related) in 190 (57.9%), combat-related (from gunshots) in 102 (31.1%), accidental falls in 17 (5.2%), violent assault in 13 (4.0%) and sports-related injuries in 6 (1.8%). The most commonly fractured site was the body (188 cases; 27.77%), followed by the parasymphysis (166 cases; 24.52%). The angle, symphysis, ramus and condyle had prevalence rates of 17.58%, 11.23%, 7.68%, and 7.38%, respectively.[3]

Level III. A cross-sectional study of 213 patients with mandibular bone fracture in Amsterdam, the Netherlands for a period of 10 years between January 2000 to January 2009 consisted of 146 male and 67 female patients with a ratio of 2.2:1, with a mean age of 32.5 (SD, 15.2) years. For male patients, violence (33.6%) was the main cause of injury while traffic accidents (50.7%) were the most common cause in female patients. Overall, the mandibular body (46.8%) was the main site involved regardless of the etiology.[47]

Level III. A cross-sectional study of 532 patients in Turkey noted that different causes were involved in young and adult patients. "The most common cause of injury in young patients was falls (65%), while road traffic accidents predominated in adult patients (88%)".[25]

Level III. A cross-sectional study of 355 patient records from São José do Rio Preto, Brazil in 2010 revealed "interpersonal violence in 99 cases (27.9%, SD%=4.5) and car accidents in 59 cases (16.6%, SD%=5.2)". Young male adults were the most prevalent victims. [30]

Level III. A cross-sectional study in the University of São Paulo, Brazil showed that 126 patients suffered a total of 201 mandibular fractures, associated or not with other maxillofacial fractures. The etiology most frequently observed was traffic accidents in 59 patients (47%). Symptoms of mandibular fractures include pain in 114 (91%), changed dental occlusion in 98 (78%), and mental nerve paresthesia in 35 (28%). Signs included facial swelling (74%), limitation of mouth opening

(55%), and malocclusion (48%).[32]

Level III. A cross-sectional study of 2,094 patients with facial fractures from various accidents in the Inha University Hospital, Incheon, South Korea revealed the most common age group was the third decade of life (29%), involving males more than females (3.98:1). The most common etiology was violent assault or nonviolent traumatic injury (49.4%) and the most common isolated fracture sites were nasal bone (37.7%), mandible (30%), orbital bones (7.6%), zygoma (5.7%), maxilla (1.3%) and frontal bone (0.3%).[37]

Level III. A cross-sectional study that reviewed records of 444 patients in the University Hospital of Freiburg, Germany noted that "road traffic accidents and fights were the leading causes of mandibular fractures, followed by falls. Bicycle accidents were the most common cause of all road traffic accidents." It was hypothesized to be related to the fact that a small university with a young population was involved. "Falls and sport accidents were also noted to be more common in larger cities".[28]

Level III. A cross-sectional study that reviewed records of 512 patients at the Philippine General Hospital from January 2004 to December 2007 noted maxillofacial fractures were most common among young adults aged 21 to 30 years old (34.8%), followed by adults aged 31 to 40 years old (22.1%). Men were injured more than women with a 7:1 ratio (males = 87% females = 13%). The most common etiology was traffic-related accidents (63.7%) in contrast to physical assault in previous decades. Other causes were physical assault or mauling (14.5%), falls (11.5%), gunshot wounds (6.4%) and hacking (3.1%). Mandibular fractures were the most common (168; 32.8%).[5]

Level III. A cross-sectional study of 314 patients from two urban centers in Lagos and Abuja, Nigeria noted "the commonest site of fracture … was the body of the mandible followed by the angle." Road traffic crashes were the leading cause (67.5%), followed by assault (18.8%). In contrast, assault was the commonest cause of injury in developed countries.[21]

Level III. A cross-sectional review of records of mandibular fractures in the United States and in Turkey between 1991 and 2000, wherein 210 Turkish patients had 252 mandibular fractures, whereas the 665 US patients had 1042 mandibular fractures. The majority of the patients were male, 84% in the US versus 76% in Turkey. Assault (53.7%) was the most common cause of mandibular fractures in the US, whereas in Turkey the most common cause was motor vehicular accident (36.2%). The angle of the mandible (27.57%) was the most common site of fracture in the US in contrast to Turkey, where the body (28.97%) was the most common fracture site. The study concluded that socioeconomic, cultural and environmental factors all play a part in determining the types of patients involved, sites of injury and the causes of the problem.[46]

Level III. A cross-sectional study of 509 patients treated at the University Hospital in Alexandria, Egypt from the year 1991 to 2000 reviewed a total of 755 mandibular fractures; 79% were composed of men with a 3.6:1 male:female ratio. Most fractures were sustained by men in the age group 21–30 years (26%) and girls between 0 and 10 years (43%). A total of 198 of 509 (39%) patients sustained fracture due to road crashes, followed by falls (n=173, 43%) and assaults (n=83, 16%). Fractures of the angle (22%) were the most common followed by the parasymphyseal region (21%) and the lowest was in the coronoid region (1%). The largest monthly incidence was in January (13%) and least in October (6%).[45]

Level III. A cross-sectional study of 144 patients serially seen at the Louisiana State University Health Science Center at New Orleans, USA with blunt trauma to the face were evaluated with tongue blade test prior to obtaining CT scans or plain radiographs of the face to determine the sensitivity and specificity of the tongue blade test on mandibular, maxillary sinus or Le Fort fracture. Overall, 16 patients (11.1%, 95% CI:6.7-17.7%) had mandibular fractures and a positive tongue blade test identified all of them. For mandibular fractures, the sensitivity was 100% and specificity was 74.8%, while in maxillary sinus fractures, tongue blade test sensitivity was 48.6% and specificity was 69.8% (95% CI:66.4-82.0%). The tongue blade test was found to be very sensitive in identifying patients with suspected mandibular fractures, but not adequate to identify mid-face fractures.[55]

Level III. A cross-sectional study in the Piracicaba Dental School, Brazil from 1999 to 2004 included a total of 1,024 patients with 1,399 facial fractures. Results revealed that "traffic accidents were the most frequent etiological factor of maxillofacial fractures irrespective of gender (46.2% for men and 40.3% for women)."[29]

Level III. A cross-sectional study of records and radiographs in maxillofacial units of two universities in Jordan showed a total of 703 patients with 892 mandibular fractures [502 (71%) male and 201 (29%) females]. There were 497 (71%) adults with 676 fractures, and 206 (29%) young patients with 216 fractures. In adults, the most common fracture site was the mandibular body (32%) often caused by road traffic accidents (47%), whereas in young patients, the condyle (38%) was the predominant

fracture site and the most common etiology was a fall (49%).[43]

Level III. A diagnostic cross-sectional study using the Manchester mandibular fracture decision rule to reduce the need for radiographs in mandibular trauma conducted at the emergency department of the Manchester Royal Infirmary, UK between July 2000 and December 2001 included 280 patients with 65 cases of mandibular fracture based on radiographs. The clinical predictors used in the decision rule for mandibular fracture had the following sensitivity rates: malocclusion (88%), pain with mouth closed (77%), trismus (63%), broken teeth (14%), and step deformity (18%). The decision rule showed 100% sensitivity and 37% specificity. The study concluded the decision rule successfully predicted a fracture in all 28 cases with clinical suspicion of fracture prior to the x-ray and 83 radiographs were avoided without missing any fracture.[50]

Level III. A cross-sectional study of 134 patients with 225 mandibular fractures at a suburban trauma center in Illinois, USA showed violent crimes (assault, gunshot wounds) accounted for the majority cause (50%) vs. motor vehicle accidents (29%). Overall, parasymphyseal fractures were most frequently involved (35%), followed by the body and angle fractures (21% and 15%, respectively). There was a statistically significant association of motor vehicle accidents with parasymphyseal fractures (45%), and gunshot wounds with body fractures (36%), whereas assault victims had a higher than predicted frequency of angle fractures (27%) and fewer parasymphyseal fractures (19%). Patients aged 17 to 30 were more likely to suffer from gunshot wounds, whereas older adults (age 31–50) were more likely to be assault victims. Patients over age 50 suffered fractures from falls at a higher than expected rate.[38]

Level III. A cross-sectional study of 449 patient records in Kaduna, Nigeria showed most fractures were caused by road crashes and involved the mandibular body (51%) followed by the angle (19%), with male preponderance (4.7 males:1 female).[20]

Level III. A cross-sectional study of 1,267 patients with clinical and radiological diagnosis of mandibular fractures at an urban level I trauma center in Washington DC, USA showed that 86% were male and 37% were in the 25 to 34-year-old age group. Use of an illicit substance at the time of trauma was seen in 55% of all cases. Interpersonal violence accounted for 79%, with prevalence in summer (31%) and winter (28%) months. The most common location was the angle (36%), followed by the body (21%) and parasymphyseal region (17%), and 52% had more than one fracture site. The evolving pattern of fractures in urban trauma centers showed an increasing trend of association with illicit substances and interpersonal violence as a major causative factor.[41]

Level III. A cross-sectional study in the Quirino Memorial Medical Center, the Philippines, from 1996 to 1997 involving 29 patients attributed the highest number of fractures to vehicular accidents at 44.8% followed by assault at 24.1%.[23]

Level III. A diagnostic cross-sectional study was conducted in an urban emergency department in Kansas City, USA from January 1, 1993, to December 31, 1993, to evaluate the diagnostic accuracy of clinical signs and symptoms of mandibular fracture. A total of 119 subjects were included in the study and 44 subjects were diagnosed with mandibular fracture. Malocclusion (33 of 44 subjects) and facial asymmetry (21 of 44 subjects) were strong predictors of fracture. A negative result on the tongue blade test (2 of 44 subjects) was a strong predictor of non-fracture. In conclusion, the tongue blade test is a useful screening tool in evaluation of patients with mandibular trauma because of its high sensitivity and negative predictive value.[52]

Level III. A cross-sectional study 138 cases of mandibular fracture in different government hospitals in the Philippines (East Avenue Medical Center, Jose R. Reyes Memorial Hospital, Philippine Orthopedic Hospital, and V. Luna Memorial Hospital) found the major cause of mandibular fracture was assault or mauling comprising 60 cases (43.5%) of the entire study.[33]

Level III. A cross-sectional study of 110 patients with complaints or physical findings suggestive of undiagnosed mandibular fracture seen at the emergency department of Kern Medical Center, California, USA from February 1992 to March 1994 where 53 patients had mandibular fractures; 41 of 53 patients had at least one mandibular fracture while 12 appeared normal on x-ray. Among 42 patients scored negative on the tongue blade test, 2 patients proved to have fractures on radiograph. The study concluded the tongue blade test had a sensitivity of 95.7%, specificity of 63.5%, a positive predictive value of 66.2%, a negative predictive value of 95.2%, and an accuracy of 77.3%.[48]

Level III. A cross-sectional study at the University of Iowa Hospitals and Clinics, USA evaluated records from 1,067 patients sustaining 1,515 mandibular fractures. The major causes of mandibular fracture were altercations (47.5%), automobile accidents (27.3%) and motorcycle accidents (4.2%), accounting for approximately one third of fractures. The causes of the remainder of mandibular fractures could be grouped into four major categories: falls (7.1%), sports-related incidents (5.4%) work-related accidents (3.0%), and other causes (5.5%).[36]

Level III. A cross-sectional study in the Canniesburn Hospital, Scotland found that 4,711 patients had maxillofacial fractures of one or more facial bones; of which 2,137 had at least one mandibular fracture (with a total of 3,462 mandibular fractures). The patients were from a large industrialized area with high rates of unemployment. The mandible is one of the more common targets in altercations and, as the majority of this sample of patients sustained trauma during altercations, one could expect this finding.[34]

Level III. A cross-sectional study of 580 patients with mandibular fractures at the University of Iowa Hospitals and Clinics, USA from 1972 to 1978 showed more fractures of the condyle (29.1%) and angle (24.5%), with correspondingly fewer parasymphysis/symphysis region (22%) and body (16%) fractures, in comparison to other reported studies. The site of fracture was related to the type of trauma involved. Altercations, in which most force is directed in a single blow to the lateral aspect of the jaw, tend to result more frequently in angle (37.3%) and body (19.4%) fractures while automobile accidents, which more frequently involve trauma to the anterior mandible, result in more fractures of the symphysis region (27.7%), alveolus (4.5%) and condyle (30.9%). Motorcycle accidents produce many more alveolar fractures (9.1%), suggesting that the traumatic force in this kind of accident is often directed to the alveolus. 46.6% of those individuals involved in motor vehicle accidents had the highest incidence of concomitant other injuries in addition to the mandibular fractures.[42]

KAS 1 Current Evidence:

Level II. Diagnostic accuracy study with a cross-sectional design comparing clinical findings and the tongue blade test against a reference standard (radiologic imaging), involving 98 patients with facial injuries at the emergency department in Kuala Lumpur, Malaysia. Although mandibular fracture cases were limited in this study (9.2% of sample size), the tongue blade test when combined with signs and symptoms demonstrated 100% specificity in correctly identifying radiologically confirmed mandibular fracture cases.[56]

Level II. A prospective multicentre diagnostic study involving four hospitals in the Netherlands comparing clinical findings, including the tongue blade test, with imaging such as CT or X-ray. The decision aid for mandibular trauma consisting of the angular compression test, axial chin pressure test, objective malocclusion, tooth mobility or avulsion and the tongue blade bite test resulted in a sensitivity of 98.5 (91.9–99.7), a specificity of 34.6 (28.5–41.2), and a negative predictive value of 98.7% (92.8–99.8).[59]

Level IV. A cross-sectional survey assessing knowledge, attitudes, and practices of clinicians in the Philippines regarding mandibular fracture diagnosis showed high knowledge scores (93.22%) in the use of the tongue blade test in the presumptive diagnosis of mandibular fracture among selected surgeons surveyed in the study.[19]

Level IV. A retrospective descriptive cross-sectional study at the University of Oradea, Romania evaluating the patterns and clinical characteristics of mandibular fractures secondary to interpersonal violence describes the association of clinical findings such as pain, malocclusion, trismus, and dental injuries to mandibular fractures.[58]

Level V. A narrative review by a radiologist from Macquarie University, Sydney, Australia describing clinical features and diagnostic approaches to mandibular fracture. The article supports the clinical relevance of malocclusion, trismus, and fractured teeth in raising suspicion for mandibular fracture.[57]

KAS 2 Previous Evidence:

Level III. A diagnostic cross-sectional study conducted at the University of Pittsburgh, PA, USA that compared the accuracy of mandibular series, panoramic radiography, digitized mandibular series, and panoramic radiography plus anteroposterior radiograph in the detection of induced fractures in 25 cadaver mandibles showed panoramic tomography is adequate for detection of fractures in the body of the mandible (88% sensitive, 94% specific).[61]

Level III. A clinical trial study conducted at the University of Texas Health Science Center, USA on adult female cadavers to assess the age and sex specific risks in adult female patients from rotational panoramic radiography estimated risk by using a computer algorithm for simulation of radiation transport through the human anatomy. The study showed that radiation doses from panoramic radiography are less than those from the 21-film full-mouth (FMX), but greater than from a 4-film interproximal (BMX) examination.[63]

Level III. A diagnostic cross-sectional comparison of panoramic tomography and mandibular series including advantages and disadvantages of each modality in 88 patients with known fractures of the mandible treated at the Medical College of Virginia Hospital, USA from February 1981 through January 1985 concluded that the panoramic view is superior to the standard mandibular series for the diagnosis of mandibular fractures. A total of 81 of 88 (92%) of the fractures were recognized in the panoramic view while only 58 of 88 (66%) were detected in plain views.[60]

Level IV. The Arbeitsgemeinschaft für Osteosynthesefragen - Cranio Maxillof Facial (AOCMF) training manual on a systematic approach to evaluation and diagnosis in craniomaxillofacial trauma stated that panoramic tomography is a useful screening tool in evaluating for mandibular fracture. It has similar or better sensitivity than standard mandibular series radiographs in detecting mandibular fracture especially the body region. It is also useful in evaluating the dentoalveolar region.[91]

Level IV. In a literature review by an author from the Department of Oral and Maxillofacial Sciences, Faculty of Dentistry, Dalhousie University, Canada, Panoramic x-ray is considered as the most informative radiograph used in diagnosing mandibular fractures. However, these are some disadvantages: 1) technique requires the patient to be in upright position; 2) difficult to appreciate the buccal lingual bone displacement as it produces a two-dimensional image; and 3) lack of fine details in the symphysis region of the mandible due to thickness of the bone.[65]

Level IV. A book chapter on Panoramic Radiology: Risk Within Reason. In: Panoramic Radiology. Springer, Berlin, discussed radiation exposure from panoramic radiography using the 'As Low As Reasonably Achievable' (ALARA) principle. Between 4.7 to 14.9 uSv radiation doses per exposure was the calculated effective dose from various panoramic units used.[64]

KAS 2 Current Evidence:

Level II. Retrospective diagnostic accuracy study at the Beheshti Hospital in Kashan, Iran evaluating the performance of panoramic radiography interpreted using an artificial intelligence model for detecting mandibular fractures. The article supports the statement that panoramic radiography may serve as an initial imaging modality in evaluating mandibular fractures. Specifically, the study states that panoramic radiography is a routine imaging technique for screening maxillomandibular structures in trauma cases; it provides an overall view of the mandible; it is cost-effective, widely available in clinical settings, and exposes patients to a low amount of radiation; and AI-assisted panoramic imaging model demonstrated high diagnostic performance for body fractures.[71]

Level II. Retrospective diagnostic accuracy study in Waikato, New Zealand evaluating machine learning-assisted detection of mandibular fractures using plain mandibular radiographs, specifically orthopantomogram (OPG) and posterior-anterior mandible (PAM) radiographs. The study mentioned that OPG and PAM radiographs demonstrated improved sensitivity compared with standard mandibular radiographic series, increasing sensitivity from 70 ± 4% up to 92% .[75]

Level II. Diagnostic accuracy study at the Charité Berlin, Germany showing that panoramic radiographs are highly accurate and sensitive in detecting mandibular fractures, with good precision in identifying true fracture cases. It also states that panoramic x-rays are commonly used as a first-level imaging technique in facial trauma patients. The study also suggests that panoramic x-ray combined with deep learning algorithms may be used to automatically detect mandibular fractures which may reduce chances of misdiagnosis.[70]

Level II. Diagnostic accuracy study from the Kyungpook National University Dental Hospital, South Korea evaluating the detection of mandibular fractures using panoramic x-ray with reference standards based on clinical and radiologic findings. The study shows that mandibular fractures can be detected on panoramic x-rays because of its high sensitivity and overall accuracy, demonstrating that this imaging modality is capable of identifying fractures in clinical settings. It also notes that panoramic radiography is a conventional and commonly used imaging technique in routine patient diagnosis. The study also suggests that panoramic radiography may be used with deep learning models to automatically detect mandibular fractures which may reduce chances of misdiagnosis.[69]

Level IV. Cross-sectional study done among surgeons in the Philippines describing clinician knowledge, attitudes, and practices regarding mandibular fracture management. The study shows that 68.14% of clinicians reported requesting panoramic x-ray as the initial imaging modality in patients with presumptive mandibular fractures. This indicates that panoramic x-ray is commonly used in clinical practice as an initial imaging tool.[19]

Level V. A review article by an author from Macquarie University, Sydney, Australia describing the imaging modalities used in mandibular fractures. The article states that plain radiographs, including panoramic x-ray, may be used as an initial imaging tool in patients with suspected mandibular fractures, particularly in stable or ambulatory patients and when CT is not available. Panoramic x-ray allows visualization of the entire mandible and can identify simple fractures.[57]

Level V. A narrative review by an author from the Department of Oral and Maxillofacial Surgery, University of Washington School of Dentistry, Seattle, WA, USA describing the diagnosis and imaging of mandibular

fractures. The evidence presented consists of an explanation of how different imaging modalities are used in clinical practice, including the role of panoramic x-ray as an initial imaging option and its limitations compared to CT. The article supports that panoramic x-ray may be used as part of the initial imaging evaluation, particularly when CT is not available, and allows visualization of the entire mandible.[66]

Level V. A narrative review by an author from the Unit of Dentistry and Oral Surgery, Department of Surgical, Medical and Molecular Pathology and Critical Care Medicine, University of Pisa, Italy describing the principles, indications, and general use of panoramic x-rays, rather than a structured diagnostic accuracy study or comparative clinical trial. The study establishes that panoramic x-ray is the most frequently prescribed screening examination in dentistry, offering advantages such as low radiation dose, low cost, and the ability to provide a comprehensive overview of the mandible and surrounding structures, making it suitable as an initial imaging modality.[67]

Level V. A narrative pictorial review by an author from the Department of Experimental and Clinical Biomedical Sciences, Radiodiagnostic Unit, University of Florence - Azienda Ospedaliero - Universitaria Careggi, Largo Brambilla, Florence, Italy describing imaging techniques for mandibular fractures. The article directly supports the use of panoramic x-ray as an initial imaging modality in patients with suspected mandibular fractures, particularly in mild or isolated cases based on how it is described and used in clinical practice.[68]

KAS 3 Previous Evidence:

Level I. An evidence-based guideline, the SEDENTEXCT project by the European Commission stated that exposure to radiation is higher in mandibular radiographs versus panoramic x-ray (<6 µSv versus 2.7-24.3 µSv), but much lower than CT scan (280 µSv - 1410 µSv).[96]

Level III. A cross-sectional study in the Department of Diagnostic Radiology (Oral and Maxillofacial Radiology), University of Pittsburgh, PA, USA comparing the diagnostic efficacies of panographic radiographs, mandibular trauma series, and digitized radiographs in detection of mandibular fractures where 25 cadaveric specimens were subjected to blunt trauma. Each specimen underwent all three imaging modalities and six observers recorded their diagnosis using a five-point confidence rating scale (1-fracture definitely absent; 2-fracture probably absent; 3-unsure whether fracture is present; 4-fracture probably present; and 5-fracture definitely present). The study stated that "location-wise differences in diagnostic accuracy were noted and possibly could be explained by the fact that visualization of the coronoid and condyle, with mean percentage of 65% on the mandibular series was relatively more difficult due to projection geometry issues and superimposition by overlying anatomy, compared with panoramic images where these were minimal to nonexistent".[61]

Level III. A diagnostic cross-sectional study evaluated 54 patients presenting with acute mandibular injury examined at the Department of Emergency Medicine, University of California San Diego Medical Center, CA, USA and compared pantomography (Panelipse Panoramic X-ray System #46181121G1) and mandibular series (postero-anterior, right and left oblique, and reverse Towne projections) in the detection of mandibular fracture. The films were read in a randomized fashion by 2 board-certified emergency physicians and a single staff radiologist without access to clinical information or identifying patient data. The sensitivity for fracture detection for each physician was 0.85, 0.77 and 0.89 with mandibular series and 0.79, 0.74, and 0.83 with pantomography. The specificity for fracture detection for each physician was 0.88, 0.92, and 0.96 for mandibular series and 0.96, 1.00 and 0.92 for pantomography. The study showed that standard mandibular series has been shown to have comparable sensitivity and specificity to pantomography in the detection of mandibular fractures.[72]

Level III. A diagnostic cross-sectional study on 21 subjects with mandibular fractures managed by the plastic surgery service, Olive View Medical Center, Sylmar, CA, USA examined all patients with a standard mandibular series (anteroposterior, right and left lateral oblique, Towne's), panoramic tomography and axial and coronal CT. Mandibular series x-ray ranked second in accuracy (93%) next to Coronal CT scan (97%), followed by panorex radiograph (90%) and axial CT (82%).[74]

Level III. A cross-sectional study comparing panoramic and standard radiographs for the diagnosis of mandibular fracture involved 50 patients with known fractures of the mandible at the Medical College of Virginia Hospital, USA from February 1981 to January 1985. Both panoramic radiograph and mandibular series were performed for all the patients within 12 hours of each other. Results of the radiograph were evaluated by two senior residents in the Oral and Maxillofacial Surgery Department. 92% of the fractures were identified from the panoramic radiographs while 66% were detected in the mandibular series. In the mandibular series, 21 out of 29 fractures in the condylar region were better evaluated by using Towne's view. All 6 cases of fracture located in the symphysis region were recognized using the posteroanterior and Towne's view while the lateral oblique view was best used in identifying ramus, angle and body fractures.[60]

Level IV. A narrative review by an author from the Department of Plastic and Hand Surgery, Regions Hospital and the University of Minnesota, MN, USA discussed the different imaging modalities in mandibular fracture stated that the plain mandibular series (which includes the postero-anterior, Towne's and lateral views) is still used as a routine screening tool in the detection of mandibular fracture in comparison to other imaging modalities. Towne's view was found particularly useful in assessing preoperative and postoperative subcondylar fractures.[73]

KAS 3 Current Evidence:

Level II. Retrospective diagnostic accuracy study evaluated radiographs ordered in the Waikato region of New Zealand using machine learning-assisted detection of mandibular fractures using posterior-anterior mandibular radiographs (PAM) in combination with orthopantomogram (OPG). The article supports the statement that plain mandibular radiography may be recommended in settings where panoramic radiography is unavailable. The study also acknowledged that plain radiographs remain commonly used in emergency settings where immediate specialist evaluation may not be available. The OPG and PAM radiographs demonstrated improved sensitivity compared with standard mandibular radiographic series, increasing sensitivity from 70 ± 4% up to 92%.[75]

Level IV. Cross-sectional study done in the Philippines showing 91.53% of surgeons reported using plain mandibular radiographs when panoramic x-ray is not available.[19]

Level V. A review article conducted by researchers from Barts and The London School of Medicine and Dentistry, Queen Mary University of London, UK describing the imaging modalities in facial trauma. The article notes that radiography of the mandible remains included as an imaging option in clinical recommendations, indicating that it may still be used in certain contexts such as limited-resource settings or when advanced imaging is unavailable.[76]

Level V. Narrative review by an author from the University of Washington School of Dentistry, Seattle, WA, USA describing the use of imaging modalities in mandibular fractures. The article states that although CT is the gold standard, plain mandibular radiographs (e.g., Reverse Towne, Caldwell posteroanterior, lateral oblique, occlusal views) may be used when CT or panoramic x-ray is not available.[66]

Level V. Narrative review by an author from the Hospital Josep Trueta, Girona, Spain discussing imaging approaches in facial trauma. Although computed tomography (CT) is the standard for detecting mandibular fractures, plain radiographs may still be used in settings with limited access to advanced imaging.[77]

KAS 4 Previous Evidence:

Level I. This systematic review conducted by researchers from the University of Alberta, Canada evaluated the data available regarding reliability and accuracy of skeletal CT landmark identification and stated that "the more complex the surgery, the more critical it is to have accurate CT data to minimize intraoperative risk and poor outcome. The acceptable degree of error will depend on the type and complexity of the surgical procedures being planned and the goals of the study".[94]

Level II. This clinical simulation study at the University of Pittsburgh, PA, USA compared the diagnostic accuracies of panoramic radiographs, mandibular series, digitized mandibular series, and panoramic radiographs - anteroposterior views in detecting facial fractures inflicted among 25 cadavers. Results showed that panoramic radiographs are adequate in detecting mandibular fractures. Addition of anteroposterior views to panoramic radiographs augment diagnostic accuracy. It was also mentioned that only in rare instances where there is extreme displacement of the fracture segments is CT indicated. An instance of such a condition is a high condylar fracture. Advanced imaging in such instances can provide multiplanar and 3-D examinations with relatively high-contrast images.[61]

Level III. A diagnostic accuracy study conducted at the Department of Oral and Maxillofacial Surgery, Dr. Ziauddin Ahmad Dental College and Hospital, Aligarh Muslim University, Aligarh, India comparing CT and plain radiographs' ability to detect facial fractures indicated that 3D CT was statistically more significant ($Z= 8.8$, $p<.001$) in terms of fracture site detection compared to conventional radiographs. Moreover, 3D CT was superior in displaying extent of fractures and comminution as well as displacement and it provided additional conceptual information compared to conventional radiographs in the majority of patients with maxillofacial trauma.[88]

Level III. A diagnostic accuracy study conducted at the Clinic for Oral and Craniomaxillofacial Surgery, University of Munich, Germany included 164 patients with suspected mandibular trauma examined by 6 oral and maxillofacial surgeons. Initial radiographic examination comprised panoramic imaging (Orthophos XG Plus, Sirona, Bensheim, Germany) and a posteroanterior skull radiograph (Siemens Multix Pro/Vertix/ Poly-doros, Siemens, Erlangen, Germany). In instances wherein there was inconclusive radiologic data, cone beam CT or CBCT

(NewTom 3G MF12, NNT Viewer Software version 3.00, 12-in FOV) was done to confirm or rule out the presence of mandibular fracture. Results showed that CBCT can identify an additional 17.75% of mandibular fractures and 14.72% in fractures and a change in treatment in 9.52% of all examined cases.[79]

Level III. A retrospective case series conducted at the Department of Oral and Maxillofacial Surgery, University Medical Center in Hamburg, Germany discussed the indications of intraoperative cone beam computed tomography (CT) as the gold standard in preoperative diagnostics of maxillofacial fractures that is performed post-operatively as well as during follow-up. Fluoroscopy based cone beam CT has also been used for surgical navigation and intraoperative assessment of adequacy of reduction in complex mandibular fractures.[83]

Level III. A cross-sectional study conducted at the Oral and Maxillofacial Radiology Tertiary Care Clinic, University of Texas Health Science Center in San Antonio, TX, USA determine the clinical usefulness of 3D CT compared to 2D CT showed that in a majority of cases within each of the four clinical groups (including trauma), the clinicians believed that 2D or 3D reformatting of the CT images provided additional useful information for patient management. In most of the cases, 3D imaging provided information in addition to that provided by the axial or 2D reformatted images.[89]

Level III. A cross-sectional study conducted at the Division of Plastic and Reconstructive Surgery and Department of Radiology Sciences, UCLA Medical Center, Los Angeles, and Olive View Medical Center, Sylmar, CA, USA comparing the diagnostic sensitivity of mandibular series and axial CT in ruling out mandibular fractures showed that CT demonstrated higher image quality scores (87%) compared to mandibular series (66%) based on reviewers' subjective assessment of quality.[93]

Level IV. The American Academy of Otolaryngology - Head and Neck Surgery (AAO-HNS) Resident's Manual of Trauma to the Face, Head, and Neck discussed the strengths of different radiographic imaging for the mandible. Panorex is an excellent screening evaluation for patients who can sit or stand upright without motion. CT Scan is generally preferred for multiple mandibular fractures and especially helpful in multiply traumatized requiring images and when visualization is difficult especially for condylar head and high condylar neck.[6]

Level IV. This narrative review conducted by researchers in Palermo and Catania, Italy discussing the role of imaging in the evaluation of complex facial fractures including important considerations to look for depending on the site of facial fracture stated that accurate maxillofacial fracture detection by CT is important for surgical treatment to avoid undesirable functional and/or cosmetic sequelae.[84]

Level IV. Basic Principles of SEDENTEXCT Guideline by the European Commission for Cone Beam CT states that "CBCT should only be used when the question for which imaging is required cannot be answered adequately by lower dose conventional (traditional) radiography".[96]

Level IV. A narrative review by authors from PA, USA discussing the advances in head and neck imaging in general stated the disadvantages of CT in the head and neck. Chief among them is radiation risk. Artifacts can also be an issue, especially in the head and neck, where the anatomy is complex and many different tissue types are in close proximity. Beam-hardening artifacts from bone, hardware, or dental amalgam, can obscure images of nearby soft tissues. Motion (e.g., from swallowing or phonation) can also cause artifacts, although this is less of an issue with the most current 64-slice scanners, which require less scan time.[95]

Level IV. A narrative review by authors from Malmõ University and the University of Gothenburg, Sweden and the Helsinki University Central Hospital, Finland discussed the differences between cone beam CT and conventional CT including several applications of each method stating that CT studies are rarely used to evaluate isolated mandibular fractures. However, they are of value in the evaluation of complex mandibular fractures including condylar fractures.[78]

Level IV. A narrative review conducted by a researcher from Sofia, Bulgaria reviewed different ER diagnostic imaging protocols for maxillofacial trauma and recommend 'mandibulo-facial series' (PA, oblique, occipito-mental and panorex) for isolated mandibular fracture and a CT scan for cases of combined midface and mandibular fracture.[80]

Level IV. This narrative review conducted by researchers from the Duke University Medical Center, Durham, NC, USA mentioned that the advent of computed tomography (CT), thin-cut facial CT scans, and most recently three-dimensional CT reformations, have improved diagnosis and have shifted the primary diagnostic modality of facial fractures from the physical exam and plain radiographs to CT.[90]

Level IV. A narrative review by the authors from the University of Wisconsin Medical School, WI, USA discussing the management of mandibular fractures states that in patients with multiple midface injuries, those wearing a cervical collar or unable to undergo panoramic

radiography, maxillofacial CT is necessary. An algorithm showed that panorex plus low Towne's view should be used for low suspicion of mandibular fracture whereas CT scan with or without 3D reconstruction is advised if there is high suspicion, with or without other facial fractures.[86]

Level IV. A narrative review by the author from the University of Louisville School of Dentistry, KY, USA discussing the evolution of imaging in maxillofacial trauma stated that although image resolution is less than conventional plain film imaging, initial investigations demonstrated that CT provided superior diagnostic accuracy compared to radiography in the diagnosis of maxillofacial injury particularly with respect to soft tissue diagnosis. One study reviewed showed that coronal CT was the most accurate method for diagnosis of mandibular fractures, followed by mandibular series and panoramic radiography.[82]

Level IV. This narrative review presented a treatment protocol utilized by oral and maxillofacial surgery departments of various US military hospitals (Wilford Hall USAF Medical Center, the National Naval Medical Center–Bethesda, Walter Reed Army Medical Center, and the National Naval Medical Center– San Diego) for maxillofacial injuries. In this protocol, imaging and stereolithographic models are done following stabilization and identification of patient injuries. A CT scan should be the minimum information obtained before surgery (although patients in this review suffered from extensive facial trauma secondary to combat injuries rather than simple and isolated mandibular fractures).[85]

Level IV. A narrative review conducted by researchers from the University Hospital Basel, Switzerland, University of Freiburg, Germany, and University of Mainz, Germany presented a comprehensive classification of craniofacial fractures and mentioned that the accurate analysis of thin axial CT slices with high-quality 2D and 3D-reconstructions guaranteed a good practical imaging approach.[91]

Level IV. A narrative review at the University Medical School Graz, Austria mentioned that the 3D extension of defects can be assessed accurately with CT. Important information concerning the amount and direction of fracture dislocation becomes clear and localization of important structures can be determined accurately.[92]

Level IV. A narrative review conducted by researchers from University of Texas Health Science Center, San Antonio, TX, USA and University of Southern California, Los Angeles, CA, USA discussing the advantages and disadvantages of CT and CBCT said that CT provides good resolution of soft and hard tissues but delivers the highest amount of radiation while CBCT is able to provide excellent information of bony structures but is not able to effectively assess the soft tissue components.[87]

Level V. A case report of a patient at the University of North Carolina, USA who sustained multiple fractures including C-1 vertebra and mandibular body determined that the positioning used for conventional films to diagnose mandibular fracture could not be done due to risk for added injury, hence CT scan was used.[81]

KAS 4 Current Evidence:

Level II. Diagnostic accuracy study from the radiology department of Beheshti Hospital, Kashan University of Medical Sciences, Iran demonstrating the performance of CT in detecting mandibular fractures. The study states that CT and CBCT have superior sensitivity (92–100%) and specificity (87–100%) compared to panoramic x-ray, supporting their effectiveness in fracture detection.[71]

Level II. Diagnostic accuracy study conducted in Thammasat University, Bangkok, Thailand demonstrating high performance of CT convolutional neural network-based models in detecting maxillofacial fractures. The study directly supports the statement that clinicians may obtain a non-contrast CT scan for assessment of maxillofacial fractures providing detailed visualization and improved accuracy in identifying fractures.[102]

Level IV. Retrospective case series at the department of Cranio-Maxillofacial Surgery, Jagiellonian University, Cracow, Poland highlighting that CT provides detailed visualization of the mandible and achieves an almost 100% diagnostic rate, supporting its effectiveness in fracture detection.[97]

Level IV. Cross-sectional study conducted at Jalappa Hospital and Research Centre in Kolar, Karnataka, India from June 2021 to June 2022 showing that CT is the imaging modality of choice for suspected mandibular fracture patients.[98]

Level IV. Cross-sectional study at the Sharif Medical City Hospital, Jati Umra, Lahore, Pakistan showing that CT provides excellent spatial resolution and are helpful in correctly identifying site, number, and concomitant facial injuries or fractures.[100]

Level V. A narrative review by a researcher from Taibah University in Medinah, Saudi Arabia investigating the performance of CT-based models in detecting maxillofacial fractures stated that CT provides

detailed visualization of maxillofacial structures and superior three-dimensional imaging for evaluating bone and fractures.[101]

Level V. According to a narrative review by researchers from London, UK, CT provides better visualization of maxillofacial structures and can detect additional or occult fractures that may not be seen on plain radiographs.[99]

Level V. A narrative review on imaging modalities for mandibular fractures conducted by a researcher from Macquarie University, Sydney, Australia states that computed tomography (CT) is the preferred method for identifying acute mandibular fractures and has very high sensitivity and specificity and that multidetector CT represents the standard of care.[57]

Level V. A narrative review by researchers from the radiology department of Hospital Josep Trueta in Girona, Spain stating that multidetector CT is the first-choice imaging test and the reference standard for facial trauma.[77]

KAS 5 Previous Evidence:

Level I. A systematic review conducted by researchers from the University of Manchester, UK on management of mandibular condyle fractures compared conservative management (closed reduction) and open reduction internal fixation. Conservative management in this study included either soft diet, analgesics and antibiotics, with or without maxillary-mandibular fixation.[107]

Level II. A quasi-experimental study conducted at Isfahan University of Medical Sciences, Iran compared the effectiveness of simple splinting and traction splinting in patients with femoral fracture on pain intensity measured in visual analog scale immediately after the 1st hour, 6th hour and 12th hour of splinting. The pain intensity decreased significantly in both groups. The reduction in pain intensity was far more superior in traction splints than simple splinting.[104]

Level IV. Practice guidelines by the American Academy of Family Physicians on casting and splinting mentioned that casting is the mainstay of treatment for most fractures and generally provides more effective immobilization.[105]

Level IV. A US patent by Baker and O'Malley from the Department of Plastic Surgery of the Orange Memorial Hospital in Orlando, FL, USA for a simplified splint for precise immobilization of the mandible or lower jawbone in mandibular injuries having a main or supporting harness of a single piece of material with a chin support and an occiput engaging support connected by curved portions passing over the ears on either side of the patient's head.[109]

Level IV. A US patent recorded on Sept. 18, 1973 for an invention by Joseph E. O' Malley illustrating the precise immobilization of mandible fractures using a one-piece device. It is made of velcro connections that support the harness around the chin to the occiput. A head strap on top also uses Velcro Connection. This invention was based on a splint for mandibular injuries, the Barton's Bandage.[108]

Level V. A case report of a 28-year-old man from Lagos, Nigeria presenting with a history of painful swollen wrist following a fall on both outstretched arms who was treated with a cast due to an undisplaced scaphoid wrist fracture and proximal pole fracture on the right and left. Conservative cast immobilization had a positive effect on early return to full activity.[106]

KAS 5 Current Evidence:

Level I This clinical practice guideline for the pain management of acute pain in emergency care by the European Society for Emergency Medicine discusses the role of immobilization, specifically skeletal traction, as one of the non-pharmacologic interventions to decrease pain. Although this guideline presents the beneficial effects of skeletal traction such as fracture stabilization and pain control among patients with femoral shaft and unstable pelvic fractures, the concept of immobilization may be applicable to most fractures including mandibular fractures. The guideline overall quality rating using AGREE II was 6/7 making it a high-quality guideline recommended for use.[110]

Level II. This clinical practice guideline on Acute Pain Management in Trauma Patients by the American College of Surgeons discussed the role of immobilization as a non-pharmacologic intervention to address pain. Immobilization serves to stabilize the affected body part prior to surgical repair. Other beneficial effects include hemorrhage reduction, fracture healing, and pain management during the acute injury period. Although the focus of the discussion specifically refers to its use in extremity and pelvic trauma, it was deemed applicable to most fractures in general, including mandibular fractures. The guideline overall quality rating using AGREE II was 5-6/7 making it a good to high-quality guideline recommended with minor modification.[111]

Level IV. Cross-sectional study of surgeons in the Philippines reported that 89.83% of respondents use a figure-of-eight (Barton's) bandage for temporary immobilization of mandibular fractures. The

evidence is classified as Level IV instead of II because the article is a cross-sectional study assessing knowledge, attitudes and self-reported practices of surgeons regarding mandibular fracture management, rather than a controlled therapeutic study.[19]

Level IV. Retrospective observational study at Shyam Shah Medical College in Madhya Pradesh, India describing the management of mandibular fractures over a 10-year period. The study reports that temporary measures such as stay wires and Barton's bandage were used to prevent displacement of fractures and reduce pain and edema in cases of delayed treatment reflecting actual clinical practice.[112]

Level V. Systematic review conducted by researchers from Salzburg and Krems, Austria describes the status of maxillofacial fracture care in middle-low income settings. It was mentioned that Barton's bandage is still included as a non-surgical option for mandibular fractures based on clinical practice experience. Although this is a systematic review, it was graded as level V evidence since the statement regarding immobilization techniques such as bandaging appears only in the introduction as background information and not as part of analyzed results. The statement was solely based on general clinical practice and expert knowledge.[113]

KAS 6 Previous Evidence:

Level I. According to the health care protocol (acute pain assessment and opioid prescribing protocol) used in Minnesota, USA, while pain screening using a numeric pain scale increases the rate of pain assessments used, this does not affect the level of pain or treatment prescription.[115]

Level I. A meta-analysis conducted by researchers from the Nuffield Department of Anaesthetics and the Pain Research Unit, University of Oxford, Oxford Radcliffe Hospital, Headington, UK investigated 1,080 patients from 11 controlled double-blinded randomized trials that evaluated the analgesic effects of various drugs in postoperative pain found that with a baseline VAS score in excess of 30 mm they would probably have recorded at least moderate pain on a 4-point categorical scale. The initial level of pain has historically been measured with a standard categorical scale (none, mild, moderate or severe). However, visual analogue scales (VAS) are often used in the belief that the measurement continuum produces greater sensitivity than the discrete points of the categorical scale.[119]

Level I. The WHO Cancer Pain Relief monograph states that in patients with mild pain, non-opioid drugs such as aspirin, paracetamol, or any of the non-steroidal anti-inflammatory drugs will be adequate. In patients with moderately severe pain, if non-opioids do not provide adequate relief when given on a regular basis, codeine or an alternative weak opioid should be prescribed.[121]

Level III. A cross-sectional study conducted by researchers from Vrije Universiteit Amsterdam, Netherlands involving 101 Dutch hospitals that were requested to submit their protocols for post-operative pain management, showed that 22 different analgesics were used in 135 administration schemes. Paracetamol, diclofenac, and morphine were mentioned in the majority of treatment schemes. All of the protocols mentioned the use of a visual analogue scale or numeric rating scale to assess pain. It also found no specialized pain protocols for the treatment of postsurgical fracture pain and that there was great variability in postoperative fracture pain; and highlights a need for the improvement of protocols used for the management of postoperative pain, as many of the pain protocols for the management of post-surgical fracture pain were incomplete and inefficient, and non-specific to postoperative fracture pain, emphasizing the importance of developing an evidence-based, clear, and specific protocol for the treatment of pain after surgical treatment of traumatic fractures.[116]

Level III. A descriptive cross-sectional study of consecutive patients admitted to four surgical wards of a major 550-bed regional hospital in Viborg, Denmark between November 2005 and May 2006 measured pain by numerical rating scales, and means and standard deviations were used to describe data. To aid interpretation of data, ratings were categorized into no pain (0), mild 1–3), moderate (4–7) and severe (8–10). The study highlights that further work is required to develop better approaches for patient assessment of pain management needs, and to ensure that patients are recognized as having an important, mutually identified clear role in their pain management to ensure their needs are met.[118]

Level III. A cross-sectional study used data from the Emergency department component of the National Hospital Ambulatory Medical Care Survey directed by the National Center for Health Statistics, Centers for Disease Control and Prevention, USA for 1997 to 2000. Of 2,828 patients with isolated closed fractures of the extremities or clavicle, 64% received any analgesic and 42% received a narcotic analgesic. The scales used (e.g. Modified Infant Pain Scale; Face, Legs, Activity, Cry, Consolability pain rating scale; and the Wong-Baker Faces pain rating scale) have been validated in infants and young children. They also concluded that additional effort and resources are needed to address the issue of undertreatment of pain in children and adults

with fractures in the ED setting. Special attention should be given to analgesia in the very old and very young. Educating providers on nonverbal options for measuring pain, especially in young children, may improve measurement and documentation of pain status and facilitate recognition and treatment of pain in these vulnerable populations.[117]

Level III. A cross-sectional study was conducted at the Emergency Department (ED), Division of General Pediatrics, The Children's Hospital of Philadelphia (CHOP), USA and the Department of Emergency Medicine, Medical College of Pennsylvania (MCP), Philadelphia, USA to see whether children received analgesic treatment similar to adults with the same acute, painful conditions. Charts of 112 pediatric patients from CHOP ED and 156 patients from the MCP ED were reviewed. The data suggest that physicians need additional education about management of acute pain.[122]

Level III. A cross-sectional review participated in by 14 accident and emergency departments in England with 100 senior house officers as respondents found a large percentage of the respondents would use an inappropriate route of administration (intramuscular 50% rather than intravenous 50%), some would use an inappropriate drug and often wait too long (90min) before giving a further dose of analgesic. Results suggest that a) there is need for further teaching on pain relief at medical schools, b) casualty officers need to be taught about analgesia when they start working in accident and emergency departments, and c) it may be beneficial for accident and emergency departments to have an analgesic policy.[120]

Level IV. The Emergency Care Acute Pain Management Manual formulated by the National Institute of Clinical Studies of Australia states that pain is a subjective experience and should be assessed using a validated pain scale. The Numerical Rating Score may be used on adults, and is a tenpoint scale rated from 0 (no pain) to 10 (worst pain possible). Moderate pain ranges from 4 to 6.[114]

KAS 6 Current Evidence:

Level I. This clinical guideline on Management of Acute Pain in Emergency Situations by the European Society for Emergency Medicine supports the use of VAS/NRS for routine pain assessment (based on validated tools and widespread clinical use), initiation of analgesia at moderate pain levels (NRS 4–6), stepwise pharmacologic management with paracetamol and opioids, and repeated reassessment of pain after intervention, as reflected in its algorithms and recommendations. The AGREE II guideline overall quality rating was 6/7 making it a high-quality guideline recommended for use.[110]

Level II. This clinical guideline by the American College of Surgeons on Best Practices for Acute Pain Management in Trauma Patients states that pain should be assessed using validated tools such as the Numerical Rating Scale (NRS) and Visual Analogue Scale (VAS), and emphasizes that pain should be reassessed systematically after interventions to evaluate response and detect complications. It also outlines multimodal pharmacologic management including acetaminophen, opioids, and adjuvant analgesics, based on accumulated evidence from various study designs. This guideline was rated 5-6/7 using AGREE II, making it a good to high-quality guideline recommended with modifications.[111]

Level II. A consensus clinical practice guideline on acute pain management by the South African Society of Anaesthesiologists recommends routine pain assessment using validated pain scales and provision of analgesia according to pain severity. The Visual Analogue Scale (VAS) and Numerical Rating Scale (NRS) are the most commonly used pain assessment tools. An NRS score of 4–7 corresponds to moderate pain. Recommended pharmacologic options for acute pain management includeParacetamol, opioids, NSAIDs, and adjuvant analgesics. This guideline had an AGREE II overall quality rating of 5-6/7, making it a good quality guideline recommended with modifications.[123]

Level V. This narrative review by researchers from the Department of Clinical Dentistry, Walailak University, Bangkok, Thailand summarizes pain mechanisms, assessment tools, and treatment modalities in oral and maxillofacial surgery, rather than a primary analytical study providing direct or high-level evidence to support the specific recommendation. The study describes that pain assessment using tools such as the Visual Analogue Scale (VAS) is commonly used in clinical studies, although it acknowledges subjectivity and variability, and outlines that analgesics such as paracetamol and opioids are commonly used for acute postoperative pain, often in combination and tailored to severity, based on multiple cited clinical studies including randomized trials. It also emphasizes that pain management requires ongoing assessment and adjustment of therapy, reflecting standard clinical practice. This supports the statement that clinicians should routinely assess pain using validated scales, initiate analgesia based on pain severity (e.g., ≥4/10), use stepwise pharmacologic management including paracetamol and opioids, and reassess until adequate pain control is achieved. It also emphasizes that pain management requires ongoing assessment and adjustment of therapy, reflecting standard clinical practice.[124]

KAS 7 Previous Evidence:

Level I. A systematic literature review of 44 studies from eight

countries addressing antibiotics and facial fracture management was performed in June 2013 to identify published studies evaluating the use of antibiotics in craniofacial trauma including the upper, middle, and lower thirds of the craniofacial skeleton. Prophylactic antibiotic use was evaluated by higher level of evidence studies for mandible fractures: preoperative antibiotic use in comminuted mandible fractures was supported, but postoperative antibiosis in mandible fractures was not.[135]

Level I. A randomized, double-blind placebo-controlled pilot clinical study of 98 patients with zygomatic or Le Fort fractures, who were treated by open reduction internal fixation at the Department of Cranio-Maxillofacial Surgery, University Hospital of Bern, Switzerland, from January 2008 to July 2011 corroborated the Surgical Infection Prevention Guideline Writers Work-group in the United States 2005 consensus paper that advised antimicrobial prophylaxis be given within 60 min before the incision is made, and then discontinued within 24 h postoperatively, as prolonged use of prophylactic antimicrobial agents showed no additional benefit, and is associated with emergence of resistant bacterial strains.[130]

Level I. A systematic review and meta-analysis of 4 RCTs by the Public Dental Health Service, University Medical and Dental School, Valencia, Spain with a total of 2063 implants and 1002 patients found that antibiotic use significantly lowered the implant failure rate (p= .003), with an odds ratio of 0.331, implying that antibiotic treatment reduced the odds of failure by 66.9%. Based on the results of this meta-analysis, and pending further research in the field, it can be concluded that there is evidence in favor of systematic antibiotic use in patients receiving dental implants, since such treatment significantly reduces implant failure. In contrast, antibiotic use does not exert a significant preventive effect against postoperative infection.[136]

Level I. A randomized double-blind clinical study in Saveetha University, Chennai, India involving 60 patients undergoing bilateral sagittal split osteotomy or BSSO (premised on the basic purpose of antibiotic prophylaxis to provide an adequate drug level in the tissues before, during, and for the shortest possible time after the procedure) randomly divided patients into two groups: group I, given a single injection of amoxicillin 1.0 g administered preoperatively followed by two postoperative doses of saline four hourly (single dose group); and group II, given a single injection amoxicillin 1.0 g administered preoperatively followed by two postoperative doses of amoxicillin 0.5 g four hourly. There was a statistical difference in the rates of infection between the two groups indicating that a short postoperative course of antibiotics is more effective than a single preoperative dose for the prevention of infection following BSSO.[129]

Level I. This clinical practice guideline for oral and maxillofacial surgery by the American Association of Oral and Maxillofacial Surgeons states that in certain circumstances, oral antimicrobial rinses and systemic antibiotics may be indicated to lower the probability of infections related to surgery. It also states that prophylaxis is recommended because endothelialization of prosthetic material occurs within 6 months after the procedure. Prophylaxis should also be considered for patients with total joint replacement.[125]

Level I. This guideline stated that for 50 years, the American Heart Association (AHA) has recommended a penicillin as the preferred choice for dental prophylaxis for infective endocarditis (IE). During these 50 years, the committee was unaware of any cases reported to the AHA of fatal anaphylaxis resulting from the administration of a penicillin recommended in the AHA guidelines for IE prophylaxis. The Committee believes that a single dose of amoxicillin or ampicillin is safe and is the preferred prophylactic agent for individuals who do not have a history of type I hypersensitivity reaction to a penicillin, such as anaphylaxis, urticaria, or angioedema. Fatal anaphylaxis from cephalosporin is estimated to be less common than from penicillin, at approximately 1 case per 1 million patients. Fatal reactions to a single dose of a macrolide or clindamycin are extremely rare. There has been only 1 case report of documented Clostridium difficile colitis after a single dose of prophylactic clindamycin.[140]

Level I. A prospective randomized trial of 291 patients presented for evaluation and treatment of open mandibular fractures at Parkland Memorial Hospital, Dallas, TX, USA from June 1999 to May 2003, where 181 patients of 291 patients met the inclusion criteria and were randomly divided into 2 groups based on whether or not they received postoperative antibiotics. Both groups received preoperative antibiotics of various regimens as well as intraoperative antibiotics on the day of surgery. The use of antibiotics in the preoperative period is standard practice in the treatment of mandibular fracture. Given the fact that mandibular fractures involving the toothbearing segments of the mandible are contaminated at the time of the fracture, as well as at the time of surgery, the use of preoperative/intraoperative or postoperative antibiotics when dealing with these injuries is intended to prevent infection in a contaminated wound.[133]

Level I. A systematic review conducted by a group of Oral and Maxillofacial Surgeons from Copenhagen, Denmark identified 4 studies

concerning the possible benefit of prophylactic antibiotics in the treatment of maxillofacial fractures combined the evidence from all 4 studies and concluded that there was a significant 3-fold decrease in infection rate with administration of antibiotics.[134]

Level I. Clinical practice guidelines on Antibiotic Prophylaxis against Wound Infections for Oral Procedures published by the Ministry of Health Malaysia (2002) classified ORIF of mandibular fractures with concomitant mucosal or skin laceration as Class III surgery requiring prophylactic antibiotics. Penicillin alone has adequate coverage for the bacterial flora causing surgical site and/or implant infection.[126]

Level I. A randomized, double-blind, and placebo-controlled clinical study in the Medical College of Virginia Hospital of Virginia Commonwealth University, USA from January 1, 1997 to December 31, 1997 randomly assigned 30 patients with uncomplicated mandibular fractures into 2 groups: group 1 (14 patients) and group 2 (16 patients). According to the classification of wounds based on their risk for infection, those associated with fractures of the mandible involving the toothbearing region (angle and body fractures) could be classified as Class III, contaminated wounds. If the patient presented with evidence of infection of the fracture or the fracture was delayed in receiving treatment, the wound could be classified as a Class IV (infected) wound. The risk of potential infection of these wounds without the use of prophylactic antibiotics ranges from 22% to 50%. However, this risk can be reduced to as low as 10% with the use of prophylactic antibiotics. In this study, the rate of infection in both groups was comparable to that of previous studies on the rate of infection in mandibular fractures when perioperative antibiotics were used. This represents further evidence that the use of prophylactic perioperative antibiotics has a benefit in reducing the rate of postoperative infection in mandibular fractures.[131]

Level I. A randomized controlled trial at the University of Miami Medical School, USA randomized 90 patients with compound mandible fracture to two antibiotic regimens. The surgical procedures were performed by oral/maxillofacial surgery. Standard treatment consisted of open reduction with either bone plates or wires with all patients receiving 6 weeks of maxillomandibular fixation. The patients were monitored at 2-week intervals for 8 weeks by two of the authors, who were blinded to which antibiotic regimen the patient was assigned. Two patients in each group had postoperative infections within the first 2 weeks of treatment. The infections resolved with local wound care, removal of internal fixation devices, and oral antibiotics. After resolution of the infection each patient had a malunion, which was managed without additional complications.[128]

Level II. A prospective cohort study conducted a regional 2-stage prospective audit involving 5 different maxillofacial units in the Yorkshire region of the UK to evaluate the effectiveness of perioperative antimicrobial prophylaxis in the treatment of mandibular fractures. The first stage (145 patients) surveyed current practice concerning antimicrobial prophylaxis and found out the current infection rate after open reduction internal fixation (ORIF) of mandibular fractures. The second stage (157 patients) implemented a common antimicrobial protocol in all units and recorded the infection rates using the new regimen. A systematic review by Andreasen et al. found a 3-fold reduction in infection in groups given antibiotic prophylaxis. The published infection rates for open reduction internal fixation (ORIF) of mandibular fractures with antimicrobial prophylaxis range from 2% to 14%. They recommend short perioperative antimicrobial prophylaxis with a maximum of 2 postoperative doses after ORIF of mandibular fractures.[127]

Level II. A retrospective (cohort) chart review of 150 patients treated operatively for both complicated and uncomplicated mandibular fractures at University of New Mexico Health Sciences Center in Albuquerque, NM, USA between January 1, 2000 and June 12, 2007 found that the use of postoperative prophylactic antibiotics does not have a statistically significant effect on postoperative infection rates in surgical management of complicated or uncomplicated mandibular fractures.[137]

Level II. A retrospective cohort study of 789 case histories regarding treatment results and nature of complications developed at the Maxillofacial Department of the National Medical University in Kyiv, Ukraine from 1999 to 2003 found that the incidence of infection in patients with mandibular fractures located in tooth bearing areas was determined by the following risk factors: social and organizational conditions of medical care, trauma pattern, pre-existing medical status and treatment tactics. The main contributory factors were delayed medical care, accompanying pathological disorders, angular location, multiple and comminuted fractures and the type of antibiotic used.[138]

Level III. A cross-sectional study of 79 patients with mandible fractures treated with ORIF at the Plastic Surgery Department of the Brigham and Women's Hospital, Boston, MA, USA from June 2007 to June 2012 revealed an overall infection rate with use of antibiotic prophylaxis of 7.59%, but patients treated with clindamycin had an infection rate of 19.35%. The infection rate when using ampicillin/sulbactam was significantly lower than clindamycin. On the basis of this review, proper antibiotic prophylaxis should cover both potential

aerobes and anaerobes.[132]

Level IV. This Pocket Guide on Antimicrobial Therapy in Otolaryngology - Head and Neck Surgery from the George Washington University School of Medicine and Health Sciences, Washington, D.C., USA states that one milliliter of saliva typically contains over 100 million anaerobic microorganisms and 10 million aerobes. The implication is that virtually all surgery in the pharynx, nasopharynx, hypopharynx, and larynx, as well as in infected ears and sinuses, is contaminated. Surgical prophylaxis requires antibiotics active vs. anaerobes. Primary prophylaxis used for oral and pharyngeal surgeries are ampicillin/sulbactam OR oral amoxicillin/clavulanate 1-hour pre op. Alternatives include IV clindamycin OR cefazolin + metronidazole pre-anesthesia.[139]

KAS 7 Current Evidence:

Level I. A systematic review and meta-analysis from the Department of Oral and Maxillofacial Surgery, University Hospitals Leuven, Belgium evaluating fracture-related infections in maxillofacial trauma using evidence from randomized controlled trials, cohort studies, case–control studies, and cross-sectional studies. The article supports the statement that prophylactic antibiotics are commonly used in mandibular fractures, and the most commonly used antibiotics are first-generation cephalosporins, amoxicillin-clavulanic acid, metronidazole, and penicillins. It also cited a randomized controlled trial demonstrating no significant difference in infection rates between a 1-day and 5-day antibiotic regimen using amoxicillin-clavulanic acid with metronidazole, supporting evidence that a single preoperative dose with 24–48 hours of postoperative antibiotics may be as effective as prolonged courses.[145]

Level I. A systematic review by an author from the Fiona Stanley Hospital, Murdoch, Australia evaluating antibiotic prophylaxis in oral and maxillofacial surgery. The study recommends the use of prophylactic antibiotics in comminuted mandibular fractures, preoperative antibiotics for comminuted mandibular fractures, and perioperative antibiotics are recommended in all facial thirds. The study also stated the use of postoperative antibiotics beyond 24 hours for mandibular fractures are not recommended. Amoxicillin orally perioperatively or penicillin V orally were the recommended regimen, and clindamycin is the drug of choice in patients allergic to penicillin.[147]

Level I. The guideline convened by the Surgical Infection Society Therapeutics and Guidelines Committee, Stanford University, CA, USA reviewed multiple high-level studies, including meta-analyses and randomized trials on perioperative and postoperative antibiotic use in mandibular fractures, and recommendations were formulated through systematic literature review and GRADE-based consensus methodology. It specifically recommends that pre-operative antibiotics should not be routinely prescribed in operative mandibular fractures and that post-operative antibiotics beyond 24 hours should likewise not be prescribed, because available evidence did not demonstrate reduction in infection, morbidity, or mortality. Although perioperative antibiotic administration within 1 hour of surgery is discussed as part of standard operative prophylaxis definitions, the guideline does not support routine prolonged prophylactic antibiotic use as proposed in the statement. This guideline was rated 6-7/7 using AGREE II making it a very high quality guideline strongly recommended for use.[142]

Level II. A systematic review by an author from the University Hospitals Leuven, Belgium synthesizing evidence from randomized controlled trials and retrospective cohort study evaluated the role of systemic antibiotic prophylaxis in maxillofacial trauma and concluded that prolonging antibiotic prophylaxis beyond 24 hours does not appear beneficial. There was no evidence supporting routine use of prophylactic antibiotics in conservatively treated fractures. However, the evidence level of this study was downgraded to Level II due to substantial methodological limitations and heterogeneity among the included studies. These included 1) considerable variability in their design and research aims, 2) a significant risk of bias identified across the studies, 3) marked variability in antibiotic regiments, fracture types, surgical management, follow-up periods and outcome definitions, 4) the review's conclusion that extending antibiotic prophylaxis beyond 24 hours does not appear beneficial and that there is no evidence supporting prophylactic antibiotics in conservatively treated fractures, 5) the inability to determine the most appropriate antibiotic type as no direct comparisons between antibiotic classes and microbiologic data were insufficient.[143]

Level II. A systematic review of randomized controlled trials and retrospective studies by an author from the University Hospital South Manchester, UK evaluated prophylactic antibiotic prescribing during management of mandibular fractures. Although penicillin was identified as the most commonly prescribed antibiotic, the review did not establish superiority of penicillin over other antibiotics or directly evaluate clindamycin as an alternative. Duration of administration of antibiotics ranged from hospital admission to five days postoperatively. Although the recommendation is derived from higher-level evidence sources including randomized controlled trials, heterogeneity of studies and lack of definitive comparative findings warrant downgrading to Level II.[150]

Level III. A retrospective cohort study at the Prisma Health Richland, South Carolina, USA evaluated adult patients who underwent mandibular fracture repair between 2014 and 2019 and compared infection outcomes between treatment groups. The study found that the rate of surgical site infection was not significantly different between patients receiving extended preoperative antibiotics (29.3%) and those receiving a single perioperative dose or no antibiotics (25.0%). In conclusion, "extended regimens of preoperative prophylactic antibiotics beyond a single dose at time of surgery do not reduce SSIs after surgical repair in mandibular fractures".[146]

Level IV. A cross-sectional survey evaluating antibiotic prescribing practices for non-condylar mandibular fractures across oral and maxillofacial surgery units in the United Kingdom demonstrated that prophylactic antibiotic use is common in clinical practice. Among 50 UK oral and maxillofacial surgery units surveyed, 45 routinely admitted patients with non-condylar mandibular fractures, and 77 out of 89 respondents reported routinely initiating preoperative intravenous antibiotics upon admission. In the preoperative period, 81% prescribed co-amoxiclav, while the remaining respondents prescribed variable combinations including amoxicillin, metronidazole, benzylpenicillin, clindamycin, clarithromycin, and cefuroxime. Postoperative antibiotics were routinely prescribed by 88% of respondents, with substantial variation in route and duration of administration. The study partially supports the statement because the findings were reflective of current prescribing practices across the UK rather than directly evaluating the effectiveness of prophylactic antibiotics in preventing infection or improving clinical outcomes.[148]

Level IV. A retrospective cohort database study of inpatient and outpatient insurance claims in the United States of America compared outcomes between patients who received prophylactic antibiotics and those who did not, by assessing rates of surgical revision, local infection, and osteomyelitis. It concluded that use of prophylactic preoperative antibiotics was not associated with improved outcomes, including reduced rates of surgical revision, local infection, or osteomyelitis. The level is downgraded to Level IV because the study has important methodological limitations because of the following: 1) study design is retrospective which makes the study susceptible to selection bias and uncontrolled confounding, 2) antibiotic exposure was determined indirectly through insurance prescription claims, 3) study concluded that use of prophylactic preoperative antibiotics was not associated with improved outcomes.[144]

Level V. A clinical consensus document of the American Association for the Surgery of Trauma (AAST) Critical Care Committee recommends that open mandible fractures should receive 24 hours or less of antibiotics , while closed, non-contaminated operative facial fractures do not require postoperative antibiotics. Fractures communicating with the oral cavity or dentate segments of the mandible are considered open and contaminated wounds. Clindamycin is identified as an alternative for penicillin-allergic patients in the recommendations tables. The recommendation is limited on expert opinion based on the consensus and synthesis of variable studies.[141]

Level V. An international cross-sectional e-survey of oral and maxillofacial surgeons in Nordic countries evaluated antibiotic prescribing practices in mandibular fracture surgery and compared these practices with previously published literature. Penicillins were the most commonly prescribed antibiotics preoperatively, perioperatively, and postoperatively, while cephalosporins and aminopenicillins were also commonly used. The statement is only partially supported by the study, as the article primarily described surgeon prescribing practices rather than providing direct comparative evidence. Limitations included: 1) a relatively small number of respondents limited to Nordic countries, 2) substantial variability in timing, duration, and antibiotic selection among clinicians, 3) the article's statement that current antibiotic practices were "not in concordance with scientific evidence" and that evidence-based guidelines remain necessary, 4) lack of direct comparison or validation of penicillin as the drug of choice and clindamycin as an alternative through controlled clinical trials within the study.[149]

KAS 8 Previous Evidence:

Level III. A cross-sectional study at the School of Dental Sciences, Sharda University, Greater Noida, India between April 2006 and March 2014 on maxillofacial trauma patients showed that the majority (449 patients) had nasotracheal intubation, 204 had oral intubations, 6 had tracheostomies, and 15 had submental intubations. The study concluded that in instances where the nasal route of intubation was contraindicated, submental intubation was a viable alternative.[159]

Level III. A narrative review with case series from the Division of Plastic and Craniofacial Surgery, Children's Mercy Hospital, Kansas, USA elaborated the advantages of submental intubation when orotracheal and nasotracheal intubation is not feasible. Of great importance to oral and maxillofacial surgeons was the ability to ensure dental occlusion throughout the procedure.[160]

Level III. A cross-sectional study in the division of Oral and

Maxillofacial Surgery, Piracicaba Dental School, State University of Campinas, UNICAMP, Piracicaba, SP, Brazil over a 10-year period from April 1999 to July 2009 found 3,149 patients with facial trauma; 2,090 of which had facial fractures with 674 subjected to general anesthesia. Fifteen patients underwent submental intubation because of a combination of fractures affecting the midface and dental occlusion. The study concluded that submental intubation is a simple, safe technique with low morbidity in operative airway management of maxillofacial trauma patients requiring access to dental occlusion and the nasal pyramid.[157]

Level III. A cross-sectional study at Al-Nahdha Hospital, Oman from July 2008 to December 2009 reviewed 177 facial trauma patients and showed that in majority (57%) of patients, nasal intubation was used and the main indication was evaluation and establishment of occlusion.[161]

Level III. A cross-sectional study at the Oral and Maxillofacial Surgery Unit, Al-Adam Hospital in Kuwait from January 1,2004 to September 15, 2007 included a total of 356 patients admitted due to maxillofacial trauma, with 222 operated on under general anesthesia and 8 subjected to submental intubation. The study concluded that it is technically easier, less time consuming and has lower morbidity compared to tracheostomy.[158]

Level IV. A narrative review on Anaesthesia for Maxillofacial Surgery by an Airway Fellow from the University College London Hospital, UK stated that nasal endotracheal tubes provide surgeons with good surgical access and of particular importance in maxillofacial trauma surgery was the usefulness of preformed north-facing tubes which can be secured to the forehead without obscuring the facial bony contour.[154]

Level IV. A narrative review on a practical guide to the difficult airway by professors from the University of Texas Medical School, Houston, TX, USA presented 2 advantages of nasotracheal intubation for procedures that would entail access to the oral cavity and face: improved patient tolerance and inability of the patient to bite the endotracheal tube.[152]

Level IV. A narrative review on anaesthetic management of maxillofacial trauma by an anaesthetist from the All India Institute of Medical Sciences, New Delhi, India emphasized that a simple and straightforward approach for airway management is important during emergency situations. Various available options include orotracheal intubation, nasotracheal intubation or a surgical airway such as tracheostomy or cricothyroidotomy.[155]

Level IV. A case report from the Surgery and Integrated Clinic Department, Aracatuba Dental School, São Paulo State University, Araraquara, São Paulo, Brazil, described the efficiency of submental intubation in management of a case with panfacial fracture wherein dental occlusion and nasal pyramid assessment was necessary.[156]

Level IV. A narrative review on airway choices in maxillofacial trauma by an anaesthetist from the Queen Elizabeth Hospital, Birmingham, West Midlands, UK stated that a nasotracheal tube may be preferred to an oral tube for better field of vision, but may have significant failure rates when attempted blind.[153]

Level IV. A case series at the Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India from November 2006 to November 2009 described 25 out of 310 patients that were selected for submental intubation and operated on under the faciomaxillary surgery department. All of the patients selected had midfacial fractures (Le Fort I and II) panfacial fractures (midfacial and mandibular fractures) in which orotracheal and nasotracheal intubation were contraindicated. Results showed that submental tracheal intubation is an effective and useful technique for airway control and is a reliable route with no safety issues.[162]

Level IV. A narrative review from the Department of Otolaryngology and Communication Sciences, State University of New York, USA recommended nasotracheal intubation followed by submental or retromolar intubation while avoiding tracheostomy to allow operative access for patients undergoing ORIF wherein occlusion should be established.[151]

KAS 8 Current Evidence:

Level II. This prospective comparative study evaluated submental intubation versus tracheostomy in patients treated at Zagazig University Hospitals, Zagazig, Egypt with maxillofacial fractures for whom nasotracheal intubation was contraindicated. The study prospectively compared operative time, complications, morbidity, and postoperative scar outcomes between airway management techniques and reported that submental intubation required significantly less time than tracheostomy (8.35 minutes vs 30.75 minutes, $p < .0001$); No complications were reported in the submental intubation group, whereas surgical emphysema occurred in two tracheostomy patients; and postoperative scar outcomes were more favorable in the submental intubation group. The article supports the statement that alternative

airway approaches may be performed when nasotracheal intubation is contraindicated, specifically in patients with panfacial trauma and naso-ethmoidal orbital fractures.[163]

Level V. An educational review/tutorial by an Anaesthetic Medical Officer at the Chris Hani Baragwanath Academic Hospital, South Africa discussing airway management techniques in patients with maxillofacial trauma that summarizes recommendations, airway techniques, contraindications, and perioperative considerations based on current literature and expert guidance. Nasotracheal intubation is preferred when surgical access to the oral cavity and mandibulomaxillary fixation are required. Other alternative techniques if nasotracheal intubation is contraindicated are submental intubation and tracheostomy.[164]

Level V. A narrative literature review by an author from the Maxillofacial Department, Royal Medical Services, Bahrain Defence Force Hospital, Kingdom of Bahrain discussing airway management techniques in maxillofacial surgery - nasotracheal intubation, submental intubation, and tracheostomy. The study concluded that "Nasotracheal intubation is the most convenient intubation method for maxillofacial surgery." Submental intubation was described as an alternative to nasotracheal intubation and tracheostomy due to fewer complications, shorter hospital stay and preferred route for panfacial fractures, and corrective jaw surgery when nasotracheostomy intubation is contraindicated.[165]

Level V. A narrative review on airway management practices in oral and maxillofacial surgery by an anesthesiologist from the Daejeon Eulji University Medical Center, South Korea. The study supports the statement that nasotracheal intubation is commonly preferred in oral and maxillofacial surgery. It specifically stated that nasotracheal intubation is "the preferred method" for surgeons performing oral and maxillofacial surgery because it improves surgical access and visualization, "the route of choice" in intraoral and mandibular surgeries because it provides a stable airway without disturbing the surgical field. However, it may be difficult or contraindicated in patients with facial trauma, skull base fracture, coagulopathy, nasal bone fracture, epistaxis, or nasal pathology. Tracheostomy is the airway management technique of choice for difficult airway management and trauma situations.[166]

Level V. A narrative review on existing airway management techniques, indications, contraindications, and perioperative considerations in patients with maxillofacial trauma by an anesthesiologist from the Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India. The article supports the statement that nasotracheal intubation is commonly preferred in maxillofacial surgery because it "can be performed in patients with limited mouth opening in the absence of skull fractures". However, nasotracheal intubation is contraindicated in nasal fractures and basilar skull fractures. Alternative airway approaches like submental intubation and tracheostomy are the alternative route for difficult airway.[167]

KAS 9 Previous Evidence:

Level II. A prospective cohort study on the non-surgical management of mandibular fractures at the Maxillofacial Surgery Unit of Aminu Kano Teaching Hospital (AKTH) Kano, Nigeria from January to December 2012 had a total of 153 patients with mandibular fractures seen but only 10 patients meeting inclusion criteria. The study showed that there was acceptable healing of all fractures with a significantly improved mean quality of life outcome from 41.42 at presentation to 59.90 at 8 weeks post op.[169]

Level II. A prospective cohort study on the quality of life after fracture treatment at the Maxillofacial Surgery Unit of Aminu Kano Teaching Hospital (AKTH) Kano, Nigeria from January to December 2012 evaluated the quality of life of patients using the General Oral Health Assessment Index (GOHAI) questionnaire on day 1, 6 weeks and 8 weeks post-trauma, and showed no significant differences in the mean scores of those treated by closed reduction/MMF and those treated by ORIF. There was a significant difference in QoL between subjects treated conservatively and those treated by either closed reduction/MMF or ORIF techniques (p=.000) at all review times. The significant difference at 8 weeks in the QoL of those treated conservatively compared with those treated surgically may be related to the type of fractures managed conservatively, which were simple, undisplaced fractures. These patients did not have the added stress of an operation.[170]

Level III. A cross-sectional study in the University Hospital, Basel, Switzerland between January 1996 and January 2001 treated 28 patients (nine females, nineteen males) with 35 fractures by observation and soft diet only for 4 weeks. Patients were selected based on criteria of: a. Non-displaced fractures by clinical and radiographic examination; b. unchanged pretraumatic occlusion; and c. willingness to participate in the study. Patients with isolated high condylar neck fractures were not included. No treatment was given, but patients were instructed to reduce mouth opening and maintain a soft diet for 4 weeks. Radiographic examinations obtained at 4, 8, and 12 weeks revealed spontaneous healing of all fractures.[168]

Level III. A cross-sectional study on mandibular fractures at the

Oral and Maxillofacial Surgery Unit, Canniesburn Hospital, Glasgow, Scotland from January 1, 1974 to December 31, 1983 included a total of 3,462 mandibular fractures in 2,137 patients with complete records, wherein 687 patients (32.1% of the total sample of 2,137) did not undergo surgical intervention and the fractures were observed for 4 to 6weeks. Likewise, for 1,038 who sustained only 1 fracture, 485 (46.7%) were kept under observation. In these cases treated without surgical intervention, the patients obtained their pretrauma centric occlusion with minimal difficulty or functional limitation.[34]

KAS 9 Current Evidence:

Level IV. A retrospective case series of referrals to the University Hospitals Birmingham (Good Hope Hospital, Heartlands Hospital, Queen Elizabeth Hospital Birmingham and Solihull Hospital), a large regional major trauma service center in the UK evaluated outcomes of non-surgical management in non-condylar mandibular fractures wherein 34 out of 155 patients (22%) with mandibular fractures underwent non-surgical management. All conservatively managed fractures demonstrated minimal displacement on radiographs. Non-surgical management demonstrated a 97% success rate, with most patients demonstrating healing without complication after six weeks of follow-up. Only two patients subsequently required ORIF due to persistent pain.[171]

KAS 10 Previous Evidence:

Level I. A randomized controlled trial by the Department of Oral and Maxillofacial Surgery, Vidya Shikshan Prasarak Mandal Dental College and Research Centre, Nagpur, Maharashtra, India included 50 patients with minimally displaced mandibular fractures from November 2009 to October 2011. Patients were divided into 2 groups: 1) the study group, treated using intermaxillary fixation screw technique; and 2) the control group, treated using eyelet interdental wiring technique. Parameters such as time for placement and removal of both, postoperative occlusion, stability of IMF wire, intraoperative pain, anesthesia, oral hygiene status, glove perforation rate and complications were evaluated. Results showed IMF screws were a viable alternative to eyelets and interdental wiring in terms of significant reduction in operating time, negligible pain and infection, trauma to marginal gingiva, and maintenance of oral hygiene. IMF screws were well tolerated both by patients and surgeons, and IMFS application is an uncomplicated and rapid technique, useful for intraoperative ORIF and long term for closed reduction.[175]

Level I. An algorithm for treatment of non-condylar mandibular fractures at the Department of Oral and Maxillofacial Surgery, University of Texas Health Science Center in San Antonio, TX, USA mentioned closed treatment for mandibular fractures and stated that closed reduction works very well when applied to appropriate fractures; IMF/MMF application restores occlusion, aids in fracture reduction and fixation and allows healing to progress.[174]

Level I. A Cochrane meta-analysis on interventions for the management of mandibular fracture included 12 studies involving 689 participants (830 fractures). Different interventions were examined and the included studies involved a limited number of participants with low number of events. The authors report inadequate evidence to support the effectiveness of a single approach in the management of mandibular fractures without condylar involvement. Treatment decisions should be based on clinician experiences and patient individual circumstances.[8]

Level I. A randomized controlled trial at the Oral Surgery Department, Faculty of Dentistry, Mansoura University, Egypt over the course of 2 years included 30 patients with 43 mandibular fractures, who had no other facial fractures. Patients were divided into 2 groups: 22 fractures in 15 patients in group A treated with conventional MMF for 6 weeks, and 21 fractures in 15 patients in group B treated with MMF for a short period of 2 weeks followed by splinting the lower jaw with an arch bar. Results showed that there was no significant difference between both patient groups with regard to mean time for fracture healing, postoperative infection, or malocclusion.[172]

Level II. A prospective cohort study of health-related quality of life (QoL) after treatment of mandibular fractures at Aminu Kano Teaching Hospital, Kano, Nigeria, from January to December 2012 illustrates a significant difference in QoL between subjects treated conservatively and those treated by either closed reduction/MMF or ORIF techniques ($p = .000$) at all review times. Regarding the psychosocial, physical, and pain domains - patients treated with ORIF reported significantly more pain, while MMF patients scored higher in the psychosocial and physical domains. Patients managed conservatively recorded a significant improvement across all three domains. The authors concluded that treatment of mandibular fracture with the use of a conservative approach in preference to ORIF to MMF, combined with adequate analgesia, showed an improved quality of life.[170]

Level II. A prospective cohort study at the Department of Plastic and Reconstructive Surgery, Pakistan Institute of Medical Sciences (PIMS), Islamabad, Pakistan, over a three-year period from September 1997 to October 2000 included 270 patients with maxillofacial injuries. Two hundred twenty eight (228) had mandibular fractures with a total of 344 fractures (single and multiple fractures per patient) found through

clinical evaluation, radiographs and CT scans. There were 2 treatment modalities used in the study: 1) closed reduction with MMF in isolated body and angle fractures; and 2) open reduction with internal fixation for symphyseal, parasymphyseal, displaced body and angle fractures, or multiple fractures. Results showed good healing in all patients as seen in the follow-up orthopantomogram at 6 weeks post-treatment and repeated after 3 months to determine the progress of bone healing.[177]

Level II. A retrospective cohort study at the Oral and Maxillofacial Surgery Service of San Francisco General Hospital, USA included 85 patients treated for mandibular fractures from January 1 to December 31, 1993. The patients were divided into 2 groups: 1) patients treated by closed reduction with MMF; and 2) patients treated with open reduction internal fixation using plates and screws. The treatment time, length of hospital stay, intraoperative time and charge analysis showed that the use of closed reduction with MMF in the management of mandibular fractures provided considerable savings over treatment by using ORIF. The use of ORIF should be reserved for patients and fracture types with specific indications.[173]

Level II. A prospective cohort study of 208 patients with 256 mandibular fractures treated with MMF at the provincial hospital in Kandy, Sri Lanka from January 1978 through December 1983 assessed union of fractures once a week and followed all patients for a period of 6 months after removal of fixation. The study revealed that a shorter period of 3-4 weeks would suffice than what has been advocated in standard texts, and age has an influence in terms of duration of immobilization, observed to be shorter in children. This must be considered during planning of maxillomandibular fixation.[176]

Level IV. A narrative review from the Department of Oral and Maxillofacial Science, Faculty of Dentistry, Dalhousie University, Nova Scotia, Canada on the management of mandibular body and symphysis fractures mentioned different treatment options and discussed the advantages and disadvantages of each. The review emphasized the importance of a combination of correct diagnosis, proper treatment plan, and appropriate intervention for a specific case and type of patient.[65]

Level IV. A textbook chapter on the Management of Mandibular Fractures from the Textbook of Advanced Oral and Maxillofacial Surgery further elaborated on advantages of closed reduction such as simplicity, reduced operative time, cost-effectiveness and avoidance of damage to adjacent structures as well as disadvantages including inability to directly visualize the reduced fracture, the need to keep the patient on a liquid diet and difficulties with speech and respiration. Evidence-based studies cited in this chapter mentioned that 75-80% of mandibular fractures treated with open and closed reduction and maxillomandibular fixation showed clinical union by 4 weeks.[178]

KAS 10 Current Evidence:

Level I. A systematic review of randomized controlled trials, prospective cohort studies, retrospective comparative studies, and observational studies by an author from the Department of Dentistry (Conservative Dentistry and Endodontics), All India Institute of Medical Sciences, Guwahati, Assam, India directly compared open reduction and closed reduction techniques for mandibular fractures. The study stated that closed reduction is associated with prolonged immobilization, commonly lasting 4–6 weeks. Prolonged immobilization may result in nutritional restrictions, speech difficulties, oral hygiene challenges, and reduced quality of life during recovery. Patient selection and fracture characteristics are important determinants of treatment choice.[179]

Level I. A systematic review and meta-analysis by an oral and maxillofacial surgeon from Nagpur, Maharashtra, India evaluated maxillomandibular fixation (MMF) techniques in the management of maxillofacial fractures . The study supports the statement that closed reduction with MMF remains an accepted treatment modality in selected mandibular fractures that does not require surgical management. MMF is used to restore premorbid occlusion and promote fracture healing. However, prolonged MMF is associated with nutritional restrictions, speech difficulties, oral hygiene challenges, and reduced quality of life.[180]

Level V. A narrative review by an author from the University of Washington School of Dentistry, Seattle, WA, USA discussing mandibular fracture management principles evaluated closed reduction with maxillomandibular fixation (MMF) for isolated mandibular body fractures. The article supports the statement that closed reduction with MMF may be considered in selected mandibular body fractures. Specifically, body fractures "can be treated with either a closed approach using MMF (or ORIF);" MMF "may be indicated in nondisplaced, favorable fractures;" and MMF requires "reliable, reproducible occlusion" using the patient's dentition or prosthesis. Prolonged intermaxillary fixation may be contraindicated in patients with psychiatric disease, seizure disorders, pulmonary disease, or gastrointestinal disorders because of aspiration concerns. Management considerations include factors affecting oral function, nutrition, and patient compliance during immobilization.[66]

KAS 11 Previous Evidence:

Level I. A randomized controlled trial selected 40 patients who sustained mandibular fractures from the outpatient department of the dental college of Yamunanagar, Haryana, India and divided them into 3 groups: 20 patients were managed with intraosseous wiring (group I) and 20 patients were managed with Titanium plate fixation, 10 with postoperative immobilization (group IIA), and 10 without postoperative immobilization (group IIB). Overall surgical morbidity of patients managed with titanium plate fixation was 60% with postoperative immobilization and 40% in patients without postoperative immobilization compared to 65% in patients managed with intraosseous wiring. Group I patients had a gap of 16.1 sq.mm; IIA, 9.1sq.mm and IIB, 7.6sq.mm. Differences in postoperative pain (p>.1) and occlusion (p>.05) between the groups were not statistically significant.[181]

Level II. An interventional quasi-experimental study of sixty patients with mandibular fractures at the King Edward Medical College, Mayo Hospital, Lahore, Pakistan from 2004 to 2005 compared 3 modalities of mandibular osteosynthesis among 20 patients in each group: MMF, transosseous wirings and miniplates. Rigid internal fixation in the form of plates was advantageous as it allowed immediate or early mandibular mobility, with good functional and aesthetic results and a low rate of complications. The major operative morbidity proved to be infection followed by malocclusion. Miniplate osteosynthesis had reduced complication rates at 20% compared to MMF at 30% and transosseous wiring at 50%.[182]

Level II. A retrospective cohort study of 205 patients seen at the Maxillofacial Unit of The Royal Melbourne Hospital in Australia from 1985 to 1990 assigned the data of the patients into 3 groups: 83 patients managed with miniplate fixation according to Champy's principles (Group I), 40 patients underwent miniplate fixation ignoring Champy's principles (Group II), and 82 had transosseous wiring (Group III). Patients managed with transosseous wiring had a significantly longer hospital stay and IMF duration, increasing the cost of treatment and patient debility; 72% of those in group III had hospital stays more than 3 days while only 44% of those in group I and II stayed over 3 days.[183]

KAS 11 Current Evidence:

Level I. A comprehensive systematic review conducted by researchers from India and the USA included multiple randomized controlled trials, non-randomized controlled trials, prospective studies and retrospective studies evaluating various intervention and fixation methods for anterior mandibular fractures. However, this evidence is indirect, as the review focuses on anterior mandibular fractures in general and does not specifically define isolated displaced unfavorable and unstable mandibular body fractures. Based on the studies, open reduction internal fixation is still the preferred method for treating the majority of displaced mandibular injuries. There is also variability among the included studies in terms of fixation techniques, fracture characteristics, and patient populations, which may affect the direct applicability of the findings to this specific recommendation.[184]

Level V. A narrative review by an author from the Department of Oral and Maxillofacial Surgery, University of Washington School of Dentistry, Seattle, WA, USA describing management options for mandibular fractures rather than clinical outcome-based research . The level of evidence is retained. However, there is significant indirectness, as it discusses general principles and techniques rather than evaluating clinically meaningful outcomes such as fracture union, infection rates, occlusion, or functional recovery specific to transosseous wiring. Imprecision and limited generalizability are also present due to the absence of primary data, control group, and outcome analysis.[66]

KAS 12 Previous Evidence:

Level I. A randomized controlled trial of 40 patients who sustained mandibular fractures selected from the outpatient department of the dental college of Yamunanagar, Haryana, India divided them into 3 groups: 20 were managed with intraosseous wiring (group I) and 20 were managed with titanium plate fixation; 10 with postoperative immobilization (group IIA) and 10 without postoperative immobilization (group IIB). The radiographic gap between fractured ends of those managed with fixation with titanium plates was less than the gap in patients managed with intraosseous wiring. The average gap in group I patients was 16.1 sq.mm, in group IIA, 9.1sq.mm and in group IIB, 7.6sq. mm. Differences in postoperative pain (p>.1) and occlusion (p>.05) between the two groups were not statistically significant.[181]

Level II. An interventional quasi-experimental study of 60 patients with mandibular fractures at the King Edward Medical College, Mayo Hospital, Lahore, Pakistan from 2004 to 2005 studied three modalities of mandibular osteosynthesis with 20 patients in each group: MMF, transosseous wiring (TOW) and miniplates. Maxillomandibular fixation and transosseous wiring are still commonly used methods today. The most common complication was infection, common in TOW and mini-plating due to direct intraoral contamination. The differences were not found to be statistically significant with infection occurring in 5% of the MMF group, 15% of the TOW group and 10% of the plating group.[182]

Level II. A cohort study involving 204 patients with mandibular body fractures who were treated with internal wire fixation from 1968 to 1976 in the Academic Hospital and Diakonessen Hospital, Groningen, Netherlands showed uneventful bone healing in 197 patients. There was delayed union in 4 patients and deep infection in 3 patients. The study concluded that internal wire fixation is suitable for treatment of mandibular body fractures.[186]

Level II. A cohort study of 148 patients from the Clinic of Maxillo-Facial Surgery, Medical Faculty, University of Zurich, Switzerland with mandibular fractures operated on using transosseous wiring from 1963 to 1972 describes that a fifth of the fractures were operated on more than 10 days after injury, and half of the complications occurred in this group. Complication rates were about three times higher than the group that had early treatment. The study concluded that transosseous wiring technique is well proven and at least as good as treatment with titanium plates.[185]

Level III. A cross-sectional study of 84 patients with mandibular fractures at the San Francisco General Hospital, USA found infectious complications in 3 of the 25 patients who were repaired after 7 or more days. Delayed repair of mandibular fractures increases the incidence of infectious complications; perhaps the increased risk of infectious complications results from treatment of compound fractures older than 72 hours because medullary bone is acutely infected and has potentially impaired blood supply (the incidence of technical complications was remarkably higher in patients repaired after 3 days).[187]

KAS 12 Current Evidence:

Level II. A randomized controlled trial at the Oral and Maxillofacial Department, Ayub Medical College/Ayub Teaching Hospital Abbotabad, Pakistan comparing transosseous wiring with maxillomandibular fixation versus miniplate fixation in patients with mandibular parasymphyseal fractures (instead of body fractures). Postoperative infection and malocclusion at 6 weeks following surgery were evaluated in 124 patients: Group A – transosseous wiring with maxillomandibular fixation (MMF); and Group B – miniplate fixation. This RCT supports the statement that transosseous wiring with MMF may serve as an option when titanium plates are unavailable or unaffordable. The authors concluded that postoperative infection and malocclusion rates were comparable between the transosseous wiring with MMF group and the miniplate fixation group, as the observed differences were not statistically significant. However, there is some imprecision due to the relatively small sample size and low event rates, as well as limited generalizability because it was conducted in a single-center setting with a short follow-up period.[189]

Level V. A cadaveric biomechanical experimental study conducted at the Massachusetts Eye and Ear Infirmary (MEE) or Massachusetts Institute of Technology (MIT), Boston, USA between July 2018 and July 2020 evaluating force resistance of interosseous wiring compared with titanium plating rather than a human clinical intervention study. The authors experimentally created mandibular angle and parasymphyseal fractures in cadaveric mandibles. Although the mandibular body was not involved, this experiment supports the concept that transosseous/interosseous wiring with maxillomandibular fixation may serve as an alternative fixation option in resource-limited settings when titanium plates are unavailable. Since the study was performed on cadaveric mandibles rather than clinical patients, there were no human clinical outcomes such as infection, malocclusion, union rates, healing or functional recovery evaluated.[188]

KAS 13 Previous Evidence:

Level I. A randomized controlled trial conducted among 80 patients with isolated mandibular fractures managed by open reduction internal fixation using two titanium miniplates in Zagazig, Egypt from 2008 to 2014 classified patients into two groups: a control group (40 patients) whose occlusion was reduced with intraoperative rigid maxillomandibular fixation (MMF) with wires and archbars, and a study group (40 patients) whose occlusion was reduced with temporary intraoperative manual MMF until plate fixation. Mouth opening was normal in 26 patients (65%) and functional in 14 patients (35%) in the study group, and it was normal in 11 patients (27.5%) and functional in 29 patients (72.5%) in the control group. The study concluded that temporary manual MMF had the advantages of shorter operative time and less risk of blood-transmitted diseases to the surgical team and the patient in addition to the benefits of immediate postoperative mandible mobilization.[191]

Level I. A randomized controlled trial among 50 patients who presented with isolated mandibular fractures in Queensland, Australia, from 2009 to 2010 compared Intermaxillary fixation (IMF) and manual reduction. Patients admitted on an even date were managed with IMF, while patients admitted on an odd date were assigned to manual reduction. IMF was associated with an increased duration of procedure ($p < .001$) and increased complication rate ($p = .063$), without any observable benefit with regard to either radiographic outcome or occlusal outcome.[192]

Level II. A retrospective cohort study of all patients with isolated

mandibular fracture managed at the Maxillofacial Unit at Newcastle General Hospital in Tyne, England over a 1-year period from 1995 to 1996 included 115 patients who fulfilled the criteria: 66 patients had their fractures reduced manually by anatomical reduction and 49 patients were reduced with pre-operative intermaxillary fixation. Results revealed no difference in the final occlusion of the patients. The study concluded that manual anatomical reduction was more economical in time and cost, safer for the operator, and more comfortable for the patient.[190]

KAS 13 Current Evidence:

Level II. A systematic review by an author from the Department of Oral and Maxillofacial Surgery, TU Dental Teaching Hospital, Maharajgunj Medical Campus, Institute of Medicine, Kathmandu, Nepal comparing manual intraoperative reduction versus intermaxillary fixation (IMF) for mandibular fractures included four studies with moderate overall certainty. The analysis demonstrated a statistically significant reduction in adverse events favoring manual reduction (odds ratio 0.42, 95% CI 0.27–0.64), with fewer occlusal disturbances, revision procedures, and infective complications. However, the evidence was derived from a small number of studies with unclear risk of bias. These findings suggest that manual intraoperative control of occlusion is an effective alternative to IMF in selected cases, supporting individualized technique selection based on fracture pattern, surgeon experience, and resource availability. The supporting evidence for this statement is classified as Level I under OCEBM, as it is based on a systematic review and meta-analysis comparing manual reduction and intermaxillary fixation for mandibular fractures. However, the level of evidence is downgraded to Level II due to important methodological limitations.[193]

Level III. A multi-center prospective study across 12 European maxillofacial centers involving 319 patients with mandibular fractures treated with open reduction internal fixation (ORIF) compared manual versus rigid intraoperative maxillomandibular fixation (MMF). Manual MMF was performed in 35% of cases and rigid MMF in 65%. No statistically significant difference was observed in postoperative malocclusion rates (3.6% vs 4.8%) or infective complications (3.6% vs 5.8%) between the two groups ($p > 0.05$). These findings suggest that both manual and rigid MMF are equally effective for intraoperative stabilization, supporting selective rather than routine use of rigid MMF.[194]

KAS 14 Previous Evidence:

Level I. A systematic review by an emergency medicine author from Duke University Medical Center, Durham, NC, USA on the effectiveness of road traffic prevention in low- and middle-income countries which included 18 articles for the qualitative synthesis on road traffic policies found that "legislation-based interventions had the strongest evidence for road traffic crash, injury, and death prevention." Legislative measures implementing a single road safety measure may also be effective; one study in Brazil suggested that legislation decreasing the legal blood alcohol content (BAC) level from 0.06 g/L to 0.02 g/L was associated with a significant ($p<.05$) reduction in both traffic fatalities (7.2% to 16%) and injuries (1.8% to 2.3%). As expected, areas with higher levels of police enforcement demonstrated higher levels of effective legislation. Similarly, in 2010, Mexico also implemented legislation to reduce the legal BAC to 0.05g/L, with increasing penalties with increasing BAC.[208]

Level I. A Cochrane systematic review on the effects of helmets for preventing injury in motorcycle riders included 61 observational studies. From four higher quality studies helmets were estimated to reduce the risk of death by 42% (OR 0.58, 95% CI 0.50 to 0.68) and from six higher quality studies helmets were estimated to reduce the risk of head injury by 69% (OR 0.31, 95% CI 0.25 to 0.38).[203]

Level II. A prospective cohort study of 83 fractures of the mandible in 252 facial trauma cases at the Canberra Hospital, Australia during a 16 month period concluded that mandible fractures caused by interpersonal violence are more severe and more likely to require surgery, especially when alcohol intoxication is involved. Alcohol involvement in mandible fracture presentation for oral maxillofacial trauma review increased the relative risk of requiring surgical intervention by 2.68 (CI 1.11–9.47).[199]

Level III. A cross-sectional review of records of 119 patients treated for mandibular fractures between 2006 and 2011 in Brazil revealed mandibular fractures mostly affect Caucasian (72.2%) men (80.7%). Road traffic accidents (RTA) caused the most fractures (49.5%), followed by physical violence, including gunshot wounds (21%). Motorcycle accidents were the most common cause of RTA (76.2%). The most affected mandibular regions were the parasymphysis (26.9%) and the mandible angle (25.1%).[40]

Level III. A cross-sectional study of 350 maxillofacial trauma patients secondary to road traffic accidents in India from 2011 to 2012 revealed that 95.75% of victims did not wear helmets and that the most common cause for accidents was not following traffic rules (24%). The study concluded that "low utilization of safety devices and negligence of traffic rules" are etiologic factors in facial trauma.[202]

Level III. A cross-sectional study of 998 cases of maxillofacial trauma over a 6 month period from June 2007 in the emergency department of Government Dental College, Calcutta, India reported that the total number of motorcycle accident cases was 191 compared to 289 in the pre helmet law period (34 % decrease in incidence of motorcycle accidents from the prelaw to postlaw period). The study concluded that helmets are effective in reducing severity of injuries from road traffic accidents, and that health and medical professionals are responsible for the safety of patients, while public awareness campaigns can help improve issues on road traffic accidents.[209]

Level III. A cross-sectional study at the Royal Hobart Hospital, Tasmania from 1993 to 1999 involving 251 patients revealed that assault was the most common cause of fractures at 55%, followed by motor vehicle accidents at 18.3%.[195]

Level III. A cross-sectional review of records of 310 motorcycle crash victims admitted to the Trauma Division, Department of Surgery, of the Philippine General Hospital from 2004 to 2006 showed that the majority of victims were young adults with a mean age of 27.7 and 83.8% were males, with maxillofacial involvement in 78%, and helmet use in only 11 of 84 (13%) injured motorcyclists. Alcohol consumption prior to the crash was documented in 88%.[196]

Level III. A cross-sectional review of alcohol involvement in cases of maxillofacial trauma among 94 patients at St. Anna Hospital in Sofia, Bulgaria during a 5-year period from 2005 to 2010 noted that 47% of trauma referrals involved alcohol. The association rose to 72% when considering assault cases alone.[198]

Level III. This cross-sectional study reviewed records of 444 patients with mandibular fracture from the year 2000 to 2005 in the University Hospital of Freiburg, Germany. There was a higher male: female ratio with regard to mandibular fractures. Road traffic accidents caused 32% of injuries followed by fights at 28%. The mandibular condyle was the most common fracture site, occurring 42% of the time.[28]

Level III. A cross-sectional study of 512 patients admitted at the Philippine General Hospital for a 4-year period from 2004 to 2007 revealed that young adults aged 21 to 30 years old were the most affected age group. The most common cause of facial fractures was road traffic accidents at 63.7%. The study suggested that a prevention protocol must be developed based on traffic–related injuries.[5]

Level III. A cross-sectional analysis of records of patients seen at the Oral and Maxillofacial Surgery Unit at Christchurch Hospital, New Zealand over an 11-year period from 1996 to 2006 examined data on demographics, fractures, mode of injuries, and treatment for maxillofacial trauma patients and revealed that alcohol was the main contributing factor for facial fractures associated with interpersonal violence. Assault was the most common cause of injury and "alcohol-related injuries were the main problem in young male adults." The study emphasized the important role of medical professionals in the rehabilitation process of patients and prevention programs.[197]

Level III. A cross-sectional study in the Quirino Memorial Medical Center, the Philippines, from 1996 to 1997 involving 29 patients attributed the highest number of fractures to vehicular accidents at 44.8% followed by assault at 24.1%. The study suggested that the government should conduct campaigns for the use of automotive safety devices and compliance by occupants.[23]

Level IV. A narrative review article from the Royal Colleges of Surgeons of Edinburgh and Ireland studied the trends in violence and emphasized the important role of physicians in patient care and violence prevention through data collection and sharing. Physicians can also contribute through community safety partnerships with the local government and police.[210]

KAS 14 Current Evidence:

Level III. A retrospective multi-database review and comparative observational analysis by an author from the Department of Oral and Maxillofacial Surgery, School of Dentistry, University of São Paulo, Brazil evaluating the relationship between traffic legislation and maxillofacial trauma incidence across multiple countries supports the statement that compliance with traffic safety laws contributes to the prevention of motor vehicle, cycling, pedestrian-related accidents, and maxillofacial injuries. Specifically, the review demonstrated that: 1. countries with rigorous enforcement achieved up to 69% reduction in road fatalities; 2. mandatory helmet laws reduced mandibular fractures from 59.5% to 39.3% after implementation; 3. helmet laws increased helmet use rates in countries with mandatory legislation compared with countries without such regulations (52.26% vs 37.21%); 4. stricter traffic law enforcement regulations reduced maxillofacial injury incidence from 22.7 to 11 cases per 100,000 population; 5. seatbelt, speed limit, anti-drunk driving, and helmet regulations were associated with reductions in traffic-related injuries and fatalities across multiple countries; 6. legislation alone is insufficient without enforcement and public education; and 7. that a "dual approach of heavy penalties and regular enforcement" is necessary to effectively reduce maxillofacial trauma.[211]

Level IV. A retrospective descriptive cross-sectional study conducted in the inpatient Department of Oral and Maxillofacial Surgery of Dhaka Dental College and Hospital, Bangladesh evaluating the epidemiology and patterns of mandibular fractures describes the causes of injury, with road traffic accidents identified as the predominant etiology (81.54%). The study supports the association between road traffic accidents and maxillofacial injuries.[212]

Level IV. A retrospective cross-sectional study in the Outpatient Maxillofacial Surgery Department of Abbasi Shaheed Hospital Karachi, Pakistan evaluating the frequency, pattern, and etiology of mandibular fractures describes the etiology of mandibular fractures, with road traffic accidents identified as the predominant cause (71.6%). The discussion recommends awareness programs and strict implementation of traffic rules to further decrease injury occurrence.[214]

Level IV. A retrospective descriptive study at the Department of Oral and Maxillofacial Surgery of the Sunyani Regional Hospital, Ghana evaluating the epidemiology and causes of mandibular fractures describes the etiology of mandibular fractures, with motor vehicular accidents identified as the predominant cause (75.4%). The study identifies poor road lighting as a contributory factor to motor vehicular accidents, thus, supporting the recommendation that clinicians should advocate for compliance with road traffic safety laws (speed limit, anti-drunk driving, seatbelt and helmet use) for the prevention of motor vehicle, cycling and pedestrian accidents and maxillofacial injuries.[213]

KAS 15 Previous Evidence:

Level III. A cross-sectional study of 200 trauma patients attended at the ENT department and trauma center, Gajra Raja Medical College and associated J.A. Group Hospitals, Gwalior, India from 2014 to 2015 revealed that 64% of the patients were males and that road traffic accidents (37%) were the most common cause of injury followed by interpersonal violence (25%).[216]

Level III. A cross-sectional review of records involving 285 patients seen at the University Hospital, Newark, New Jersey, USA (a level 1 trauma center) from 2000 to 2012 revealed that 124 patients (43.5%) obtained fractures from interpersonal violence. Mandibular fractures were the most common site involved in fractures secondary to interpersonal violence.[217]

Level III. A cross-sectional review of records of 310 motorcycle crash victims admitted to the Trauma Division, Department of Surgery, of the Philippine General Hospital from 2004 to 2006 showed that the majority of victims were young adults with a mean age of 27.7 and 83.8% were males, with maxillofacial involvement in 78%, and helmet use in only 11 of 84 (13%) injured motorcyclists. Alcohol consumption prior to the crash was documented in 88%.[196]

Level III. A cross-sectional study of 512 patients admitted at the Philippine General Hospital for a 4-year period from 2004 to 2007 revealed that young adults aged 21 to 30 years old were the most affected age group. The most common cause of facial fractures was road traffic accidents at 63.7%. The study suggested that "a prevention protocol must be developed based on traffic–related injuries."[5]

Level III. A cross-sectional analysis of records of patients seen at the Oral and Maxillofacial Surgery Unit at Christchurch Hospital, New Zealand over an 11-year period from 1996 to 2006 examined data on demographics, fractures, mode of injuries, and treatment for maxillofacial trauma patients and revealed that alcohol was the main contributing factor for facial fractures associated with interpersonal violence. Assault was the most common cause of injury and "alcohol related injuries were the main problem in young male adults." The study emphasized the important role of medical professionals in the rehabilitation process of patients and prevention programs.[201]

Level III. A cross-sectional study involving 92 patients seen at the emergency department at the University Hospital, University of Medicine and Dentistry of New Jersey, USA from 1999 to 2000 noted that 80% of the patients were males and that assault (75%) was the most common cause of facial trauma followed by motor vehicle accidents (18.5%). "In response to the health promotion portion of the interview schedule, 82.6% (n = 76) of all participants expressed willingness to change behavior patterns that may be contributing to facial trauma. Most respondents appeared to be in the contemplation or preparation stage of change." The study concluded that "patients experiencing recurrent trauma are responsive to violence reduction programs."[215]

Level IV. A narrative review article from the Royal Colleges of Surgeons of Edinburgh and Ireland studied the trends in violence and emphasized the important role of physicians in patient care and violence prevention through data collection and sharing. Physicians can also contribute through community safety partnerships with the local government and police.[210]

KAS 15 Current Evidence:

Level IV. A retrospective observational study in the Maxillofacial Surgery Department, University Hospital of Marche, Ancona, a Southern

European Level I Trauma Center in Italy from January 2011 to December 2022 evaluated the epidemiology and outcomes of interpersonal violence-related facial fractures and highlighted the need for public health and multidisciplinary approaches.[218]

Level IV. A retrospective cross-sectional study evaluating the epidemiology, patterns, and causes of maxillofacial fractures related to interpersonal violence in Mexico City described the burden and patterns of interpersonal violence. Interpersonal violence was identified as a major cause of facial fractures and reported as a leading etiology, emphasizing the need for preventive strategies, public health measures, and multidisciplinary approaches.[219]

Level IV. A retrospective descriptive cross-sectional study in the University Clinic for Oral and Maxillofacial Surgery in northwestern Romania evaluating the patterns and characteristics of mandibular fractures secondary to interpersonal violence described the epidemiology and associated risk factors such as alcohol use, low education, and demographic characteristics. The study suggests that education, alcohol control, and social policies may reduce mandibular fractures, and the evidence supports the association between interpersonal violence and mandibular fractures and recommends clinician-driven preventive strategies.[58]

Level V. A narrative review by an author from the Department of Medicine and Surgery, Kore University of Enna, Italy describing the burden, etiology, and prevention strategies of maxillofacial trauma synthesized existing literature, described the role of interpersonal violence as a major cause of maxillofacial injuries, and proposed prevention strategies such as violence prevention programs and multidisciplinary approaches. The review stated that prevention requires collaboration among healthcare professionals, policymakers, and community stakeholders and supports the importance of clinician involvement in prevention at a public health level.[220]

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REFERENCES

1. Lapeña JF, David J, Acluba - Pauig AN, Maglaya JG, Donato EM, Roasa F, et al. Management of isolated mandibular body fractures in adults. *Philipp J Otolaryngol Head Neck Surg*. 2021 Nov (Supp):1-43. DOI:10.32412/pjohns.vi.1857
2. David J, Laxamana J, Altura I, Caro D, De Guzman I, Yanga V. A survey of mandibular fracture location in Philippine ORL-HNS institutions from 2010-2017. *(Unpublished)*.
3. Galvan GNB. Evaluation of mandibular fractures in a tertiary military hospital: A 10-year retrospective study. *Philipp J Otolaryngol-Head Neck Surg*. 2011;26(1):16-20. DOI:10.32412/pjohns.v26i1.595
4. Chegar B, Tatum III S. Nasal Fractures. In: Flint PW, Haughey BH, Lund V, Niparko JK, Robbins KT, Thomas JR, Editors. Cumming's Otolaryngology - Head and Neck Surgery. 6th ed. Philadelphia: Elsevier; 2015. p. 493-505.
5. Germar G, Cruz M. A four-year study of the demographic distribution and treatment of maxillofacial fractures admitted at the Philippine General Hospital. *Acta Med Philipp*. 2009;1(43(3):16-25.
6. Eusterman V. Mandibular Trauma. In: Brennan J, Holt G, Connor M, Donald P, Eusterman V, Hayes D, Editors. Resident Manual of Trauma to the Face, Head, and Neck. Alexandria, VA: American Academy of Otolaryngology Head and Neck Surgery Foundation; 2012. p. 100-139.
7. Lieblich SE, Dym H, Fenton D. Dentoalveolar surgery. *J Oral Maxillofac Surg*. 2017 Aug;75(8S):e50-e73. DOI:10.1016/j.joms.2017.04.028 PubMed PMID: 28728738.
8. Nasser M, Pandis N, Fleming PS, Fedorowicz Z, Ellis E, Ali K. Interventions for the management of mandibular fractures. *Cochrane Database Syst Rev*. 2013 Jul 8;2013(7). DOI:10.1002/14651858.CD006087.pub3 PubMed PMID: 23835608; PubMed Central PMCID: PMC11654902.
9. Ministry of Health Malaysia, Oral Health Programme. Clinical Practice Guidelines: Management of Unilateral Condylar Fracture of the Mandible. Published online 2005. [cited 2026 March 8]. Available from: https://www.scribd.com/document/53319982/CPG-Management-of-Unilateral-Condylar-Fracture-of-Mandible-1
10. Prein J, Ehrenfeld M. Introduction. In: Ehrenfeld M, Manson PN, Prein J., Editors. Principles of Internal Fixation of the Craniomaxillofacial Skeleton Trauma and Orthognatic Surgery. AO Foundation. New York: Thieme; 2012. p. 3-14.
11. Cienfuegos R, Cornelius C, Ellis III E, Kushner G. AO Surgery Reference. 1st ed. AO Foundation. [cited 2026 June 15]. Available from: https://surgeryreference. aofoundation.org/cmf/trauma/mandible
12. Rosenfeld RM, Shiffman RN, Robertson P. Clinical Practice Guideline Development Manual, Third Edition: A Quality-Driven Approach for Translating Evidence into Action. *Otolaryngol Head Neck Surg*. 2013 Jan;148(S1). DOI:10.1177/0194599812467004 PubMed PMID: 23243141.
13. Howick J, Chalmers I, Glasziou P, Greenhalgh T, Henegan C, Liberati A, et al. The Oxford 2011 Levels of Evidence. *Oxf Cent Evid-Based Med*. [cited 2026 Apr 1]. Available from: https://www.cebm.net/index.aspx?o=5653
14. Brouwers MC, Kho ME, Browman GP, Burgers JS, Cluzeau F, Feder G, et al. AGREE II: advancing guideline development, reporting and evaluation in health care. *CMA J*. 2010 Dec 14;182(18):E839-E842. DOI:10.1503/cmaj.090449 PubMed PMID: 20603348; PubMed Central PMCID: PMC3001530.
15. Rosenfeld RM, Nnacheta LC, Corrigan MD. Clinical Consensus Statement Development Manual. *Otolaryngol Neck Surg*. 2015 Nov;153(S2):S1-S14. DOI:10.1177/0194599815601394. PubMed PMID: 26527615.
16. Am Thorac Soc. Policy for Management of Financial Conflicts of Interest in the Development of ATS Clinical Practice Guidelines. Published online January 7, 2015. [cited 2026 Jun 10]. Available from: https://www.thoracic.org/statements/document-development/resources/cpg-specific-coi-policy.pdf
17. Williams MJ, Kevat DAS, Loff B. Conflict of interest guidelines for clinical guidelines. *Med J Aust*. 2011 Oct 17;195(8):442-445. DOI:10.5694/mja10.11130. PubMed PMID: 22004385.
18. Miguel RTD, Silvestre MAA, Salaveria-Imperial MLA, Tolosa MTS, Eubanas GAS, Dans LF. Disclosures of conflicts of interest in clinical practice guidelines. *Clin Epidemiol Glob Health*. 2021;9:355-359. DOI:10.1016/j.cegh.2020.10.009
19. Edora BD, Lapeña JF. Knowledge, Attitudes and Practices of Selected Filipino Surgeons Regarding the Clinical Practice Guidelines on the Management of Isolated Mandibular Body Fractures In Adults. *Philipp J Otolaryngol Head Neck Surg*. 2026 Apr;41(1):43. DOI:10.32412/pjohns.v41i1.2873
20. Adebayo ET, Ajike OS, Adekeye EO. Analysis of the pattern of maxillofacial fractures in Kaduna, Nigeria. *Br J Oral Maxillofac Surg*. 2003 Dec;41(6):396-400. DOI:10.1016/S0266-4356(03)00165-7 PubMed PMID: 14614869.
21. Adeyemo WL, Iwegbu IO, Bello SA, Okoturo E, Olaitan AA, Ladeinde AL, et al. Management of mandibular fractures in a developing country: A review of 314 cases from two urban centers in Nigeria. *World J Surg*. 2008 Dec;32(12):2631-2635. DOI:10.1007/s00268-008-9773-8 PubMed PMID: 18841410
22. Afrooz PN, Bykowski MR, James IB, Daniali LN, Clavijo-Alvarez JA. The epidemiology of mandibular fractures in the United States, Part 1: A review of 13,142 cases from the US National Trauma Data Bank. *J Oral Maxillofac Surg.* 2015 Dec;73(12):2361-2366. DOI:10.1016/j.joms.2015.04.032 PubMed PMID: 26006752
23. Agbayani-De Jesus L. Mandibular fractures: a 2-year retrospective study. *Philipp J Otolaryngol Head Neck Surg*. 1999;14(4):6-8.

24. Arabion H, Tabrizi R, Aliabadi E, Gholami M, Zarei K. A retrospective analysis of maxillofacial trauma in Shiraz, Iran: a 6-year- study of 768 patients (2004-2010). *J Dent (Shiraz)*. 2014 Mar;15(1):15-21. PubMed PMID: 24738085; PubMed Central PMCID: PMC3986572.
25. Atilgan S, Erol B, Yaman F, Yilmaz N, Ucan MC. Mandibular fractures: a comparative analysis between young and adult patients in the southeast region of Turkey. *J Appl Oral Sci*. 2010 Jan-Feb;18(1):17-22. DOI:10.1590/S1678-77572010000100005 PubMed PMID: 20379677; PubMed Central PMCID: PMC5349041.
26. Somensi MA, De Oliveira Gonçalves A, Navarro CM, Hochuli Vieira E, Gonçalves A. A six-year retrospective study of maxillofacial fractures from radiographic findings in Brazil. *Rev Fac Odontol - UPF*. 2013 Jan-Apr;18(1):49-54. DOI: 10.5335/rfo.v18i1.3007
27. Boffano P, Kommers SC, Karagozoglu KH, Gallesio C, Forouzanfar T. Mandibular trauma: a two-centre study. *Int J Oral Maxillofac Surg*. 2015 Aug;44(8):998-1004. DOI:10.1016/j.ijom.2015.02.022 PubMed PMID: 25813086.
28. Bormann KH, Wild S, Gellrich NC, Kokemüller H, Stühmer C, Schmelzeisen R, et al. Five-year retrospective study of mandibular fractures in Freiburg, Germany: incidence, etiology, treatment, and complications. *J Oral Maxillofac Surg*. 2009 Jun;67(6):1251-1255. DOI:10.1016/j.joms.2008.09.022 PubMed PMID: 19446212.
29. Brasileiro BF, Passeri LA. Epidemiological analysis of maxillofacial fractures in Brazil: a 5-year prospective study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2006 Jul;102(1):28-34. DOI:10.1016/j.tripleo.2005.07.023 PubMed PMID: 16831669.
30. Carvalho TBO, Cancian LRL, Marques CG, Piatto VB, Maniglia JV, Molina FD. Six years of facial trauma care: an epidemiological analysis of 355 cases. *Braz J Otorhinolaryngol*. 2010 Sep-Oct;76(5):565-574. DOI:10.1590/S1808-86942010000500006 PubMed PMID: 20963338; PubMed Central PMCID: PMC9450799.
31. Chrcanovic BR, Abreu MHNG, Freire-Maia B, Souza LN. 1,454 mandibular fractures: a 3-year study in a hospital in Belo Horizonte, Brazil. *J Craniomaxillofac Surg*. 2012 Feb;40(2):116-123. DOI:10.1016/j.jcms.2011.03.012 PubMed PMID: 21458284.
32. de Matos FP, Arnez MFM, Sverzut CE, Trivellato AE. A retrospective study of mandibular fracture in a 40-month period. *Int J Oral Maxillofac Surg*. 2010 Jan;39(1):10-15. DOI:10.1016/j.ijom.2009.10.005 PubMed PMID: 19914802.
33. Dugan MA, De Gracia MA, Villanueva SD, Uy HG. 138 cases of mandibular fractures in four government hospitals from July 1995 to July 1996. *J Philipp Dent Assoc*. 1998 Mar-May;49(4):56-70. PubMed PMID: 10202526.
34. Ellis E, Moos KF, El-Attar A. Ten years of mandibular fractures: An analysis of 2,137 cases. *Oral Surg Oral Med Oral Pathol*. 1985 Feb;59(2):120-129. DOI:10.1016/0030-4220(85)90002-7 PubMed PMID: 3856795.
35. Ferreira MC, Batista AM, Ferreira FdO, Ramos-Jorge ML, Marques LS. Pattern of oral–maxillofacial trauma stemming from interpersonal physical violence and determinant factors. *Dent Traumatol*. 2014 Feb;30(1):15-21. DOI:10.1111/edt.12047 PubMed PMID: 23675634.
36. Fridrich KL, Pena-Velasco G, Olson RA. Changing trends with mandibular fractures: a review of 1,067 cases. *J Oral Maxillofac Surg*. 1992 Jun;50(6):586-589. DOI:10.1016/0278-2391(92)90438-6 PubMed PMID: 1593318.
37. Hwang K, You SH. Analysis of facial bone fractures: An 11-year study of 2,094 patients. *Indian J Plast Surg*. 2010 Jan;43(1):42-48. DOI:10.4103/0970-0358.63959 PubMed PMID: 20924449; PubMed Central PMCID: PMC2938622.
38. King RE, Scianna JM, Petruzzelli GJ. Mandible fracture patterns: A suburban trauma center experience. *Am J Otolaryngol*. 2004 Sep-Oct;25(5):301-307. DOI:10.1016/j.amjoto.2004.03.001 PubMed PMID: 15334392.
39. Morris C, Bebeau NP, Brockhoff H, Tandon R, Tiwana P. Mandibular fractures: An analysis of the epidemiology and patterns of injury in 4,143 fractures. *J Oral Maxillofac Surg*. 2015 May;73(5):951.e1-951.e12. DOI:10.1016/j.joms.2015.01.001 PubMed PMID: 25883009.
40. Munante-Cardenas JL, Facchina Nunes PH, Passeri LA. Etiology, treatment, and complications of mandibular fractures. *J Craniofac Surg*. 2015 May;26(3):611-615. DOI:10.1097/SCS.0000000000001273 PubMed PMID: 25643329.
41. Ogundare BO, Bonnick A, Bayley N. Pattern of mandibular fractures in an urban major trauma center. *J Oral Maxillofac Surg*. 2003 Jun;61(6):713-718. DOI:10.1053/joms.2003.50118 PubMed PMID: 12796884.
42. Olson RA, Fonseca RJ, Zeitler DL, Osbon DB. Fractures of the mandible: A review of 580 cases. *J Oral Maxillofac Surg*. 1982 Jan;40(1):23-28. DOI:10.1016/S0278-2391(82)80011-6 PubMed PMID: 6950035.
43. Qudah MA, Al-Khateeb T, Bataineh AB, Rawashdeh MA. Mandibular fractures in Jordanians: a comparative study between young and adult patients. *J Cranio-Maxillofac Surg*. 2005 Apr;33(2):103-106. DOI:10.1016/j.jcms.2004.07.007. PubMed PMID: 15804588.
44. Ramadhan A, Gavelin P, Hirsch JM, Sand LP. A retrospective study of patients with mandibular fractures treated at a Swedish University Hospital 1999-2008. *Ann Maxillofac Surg*. 2014 Jul-Dec;4(2):178-181. DOI:10.4103/2231-0746.147119. PubMed PMID: 25593868; PubMed Central PMCID: PMC4293839.
45. Sakr K, Farag IA, Zeitoun IM. Review of 509 mandibular fractures treated at the University Hospital, Alexandria, Egypt. *Br J Oral Maxillofac Surg*. 2006 Apr;44(2):107-111. DOI:10.1016/j.bjoms.2005.03.014. PubMed PMID: 15896887.
46. Simsek S, Simsek B, Abubaker AO, Laskin DM. A comparative study of mandibular fractures in the United States and Turkey. *Int J Oral Maxillofac Surg*. 2007 May;36(5):395-397. DOI:10.1016/j.ijom.2006.11.010. PubMed PMID: 17391922.
47. Van Den Bergh B, Van Es C, Forouzanfar T. Analysis of mandibular fractures. *J Craniofac Surg*. 2011Sep;22(5):1631-1634. DOI:10.1097/SCS.0b013e31822e5f20. PubMed PMID: 21959402.
48. Alonso LL, Purcell TB. Accuracy of the tongue blade test in patients with suspected mandibular fracture. *J Emerg Med*. 1995 May-Jun;13(3):297-304. DOI:10.1016/0736-4679(95)00006-v. PubMed PMID: 7673618.
49. Timashpolsky A, Dagum AB, Sayeed SM, Romeiser JL, Rosenfeld EA, Conkling N. A prospective analysis of physical examination findings in the diagnosis of facial fractures: Determining predictive value. *Plast Surg*. 2016 Summer;24(2):73-79. DOI:10.4172/plastic-surgery.1000958. PubMed PMID: 27441188; PubMed Central PMCID: PMC4942239.
50. Charalambous C, Dunning J, Omorphos S, Cleanthous S, Begum P, Mackway-Jones K. A maximally sensitive clinical decision rule to reduce the need for radiography in mandibular trauma. *Ann R Coll Surg Engl*. 2005 Jul;87(4):259-263. DOI:10.1308/1478708051810. PubMed PMID: 16053686; PubMed Central PMCID: PMC1963934.
51. Malhotra R, Dunning J. The utility of the tongue blade test for the diagnosis of mandibular fracture. *Emerg Med J*. 2003 Nov;20(6):552-553. DOI:10.1136/emj.20.6.552. PubMed PMID: 14623851; PubMed Central PMCID: PMC1726238.
52. Schwab RA, Genners K, Robinson WA. Clinical predictors of mandibular fractures. *Am J Emerg Med*. 1998 May;16(3):304-305. DOI:10.1016/S0735-6757(98)90108-5. PubMed PMID: 9596439.
53. Caputo ND, Raja A, Shields C, Menke N. Re-evaluating the diagnostic accuracy of the tongue blade test: still useful as a screening tool for mandibular fractures? *J Emerg Med*. 2013 Jul;45(1):8-12. DOI:10.1016/j.jemermed.2012.11.078 PubMed PMID: 23490109.
54. Neiner J, Free R, Caldito G, Moore-Medlin T, Nathan CA. Tongue blade bite test predicts mandible fractures. *Craniomaxillofac Trauma Reconstr*. 2016 Jun;9(2):121-124. DOI:10.1055/s-0035-1567812 PubMed PMID: 27162567; PubMed Central PMCID: PMC4858423.
55. Haydel MJ, Meyers R, Mills L. Use of the tongue-blade test to Identify patients with mandible & maxillary sinus fractures. *Ann Emerg Med*. 2005 Sep;46(3):66. DOI:10.1016/j.annemergmed.2005.06.246
56. Kuck JY, Azhar AMN, Wee N, Manikam R. Diagnostic accuracy of the tongue blade test combined with clinical signs to detect maxillary and mandibular fractures in the emergency department. *World J Emerg Med*. 2023;14(2):122-127. DOI:10.5847/wjem.j.1920-8642.2023.032. PubMed PMID: 36911056; PubMed Central PMCID: PMC9999133.
57. Sheng K. Radiological investigation of acute mandibular injury. *Natl J Maxillofac Surg*. 2022 May-Aug;13(2):165-171. DOI:10.4103/njms.NJMS_27_19. PubMed PMID: 36051802; PubMed Central PMCID: PMC9426694.
58. Rivis M, Juncar RI, Moca AE, Moca RT, Juncar M, Țenț PA. Patterns of mandibular fractures through human aggression: A 10-year cross-sectional cohort retrospective study. *J Clin Med*. 2023 Jun 17;12(12):4103. DOI:10.3390/jcm12124103. PubMed PMID: 37373796 PubMed Central PMCID: PMC10299106.
59. Rozema R, Moumni ME, De Vries GT, Spijkervet FKL, Verbeek R, Kleinbergen JYJ, et al. A clinical decision aid for patients with suspected midfacial and mandibular fractures (the REDUCTION-I study): A prospective multicentre cohort study. *Eur J Trauma Emerg Surg*. 2022 Oct;48(5):4243-4254. DOI:10.1007/s00068-022-01968-1. PubMed PMID: 35430710; PubMed Central PMCID: PMC9532332.
60. Chayra GA, Meador LR, Laskin DM. Comparison of panoramic and standard radiographs for the diagnosis of mandibular fractures. *J Oral Maxillofac Surg*. 1986 Sep;44(9):677-679. DOI:10.1016/0278-2391(86)90034-0. PubMed PMID: 3462360.
61. Nair MK, Nair UP. Imaging of mandibular trauma: ROC analysis. *Acad Emerg Med*. 2001Jul;8(7):689-695. DOI:10.1111/j.1553-2712.2001.tb00186.x. PubMed PMID: 11435182.
62. Buitrago-Téllez CH, Cornelius CP, Prein J, Kunz C, Di Ieva A, Audigé L. The comprehensive AOCMF classification system: Radiological issues and systematic approach. *Craniomaxillofac Trauma Reconstr*. 2014 Dec;7(S1):123-130. DOI:10.1055/s-0034-1389565. PubMed PMID: 25489396; PubMed Central PMCID: PMC4251726.
63. Gibbs SJ, Pujol A, McDavid WD, Welander U, Tronje G. Patient risk from rotational panoramic radiography. *Dentomaxillofac Radiol*. 1988;17(1):25-32. DOI:10.1259/dmfr.1988.0003. PubMed PMID: 3251793.
64. Farman AG. Panoramic radiology: risk within reason. In: Farman AG, editor. Panoramic Radiology Seminars on Maxillofacial Imaging and Interpretation. Berlin: Springer; 2007. p.25-32. DOI:10.1007/978-3-540-46230-9_4
65. Goodday RHB. Management of fractures of the mandibular body and symphysis. *Oral Maxillofac Surg Clin North Am*. 2013 Nov;25(4):601-616. DOI:10.1016/j.coms.2013.07.002. PubMed PMID: 24021623.
66. Panesar K, Susarla SM. Mandibular fractures: Diagnosis and management. *Semin Plast Surg*. 2021Oct 11;35(4):238-249. DOI:10.1055/s-0041-1735818. PubMed PMID: 34819805; PubMed Central PMCID: PMC8604616.
67. Izzetti R, Nisi M, Aringhieri G, Crocetti L, Graziani F, Nardi C. Basic knowledge and new advances in panoramic radiography imaging techniques: A narrative review on what dentists and radiologists should know. *Appl Sci*. 2021 Aug;11(17):7858. DOI:10.3390/app11177858
68. Nardi C, Vignoli C, Pietragalla M, Tonelli P, Calistri L, Franchi L, et al. Imaging of mandibular fractures: A pictorial review. *Insights Imaging*. 2020 Feb 19;11(1):30. DOI:10.1186/s13244-020-0837-0. PubMed PMID: 32076873; PubMed Central PMCID: PMC7031477.
69. Son DM, Yoon YA, Kwon HJ, An CH, Lee SH. Automatic detection of mandibular fractures in panoramic radiographs using deep learning. *Diagnostics (Basel)*. 2021 May 22;11(6):933. DOI:10.3390/diagnostics11060933. PubMed PMID: 34067462; PubMed Central PMCID: PMC8224557.
70. Vinayahalingam S, Van Nistelrooij N, Van Ginneken B, Bressem K, Tröltzsch D, Heiland M, et al. Detection of mandibular fractures on panoramic radiographs using deep learning. *Sci Rep*. 2022 Nov 15;12(1):19596. DOI:10.1038/s41598-022-23445-w. PubMed PMID: 36379971; PubMed Central PMCID: PMC9666517.
71. Yari A, Fasih P, Hooshiar MH, Goodarzi A, Fattahi SF. Detection and classification of mandibular fractures in panoramic radiography using artificial intelligence. *Dentomaxillofac Radiol*. 2024 Sep 1;53(6):363-371. DOI:10.1093/dmfr/twae018. PubMed PMID: 38652576; PubMed Central PMCID: PMC11358630.
72. Guss DA, Clark RF, Peitz T, Taub M. Pantomography vs mandibular series for the detection of mandibular fractures. *Acad Emerg Med*. 2000 Feb;7(2):141-145. DOI:10.1111/j.1553-2712.2000.tb00517.x. PubMed PMID: 10691072.
73. Schubert W. Radiographic diagnosis of mandibular fractures: Mode and implications. *Oper Tech Otolaryngol-Head Neck Surg*. 2002 Dec;13(4):246-253. DOI:10.1016/S1043-1810(02)80054-9

74. Markowitz BL, Sinow JD, Kawamoto HK Jr, Shewmake K, Khoumehr F. Prospective comparison of axial computed tomography and standard and panoramic radiographs in the diagnosis of mandibular fractures: *Ann Plast Surg*. 1999 Feb;42(2):163-169. DOI:10.1097/00000637-199902000-00010. PubMed PMID: 10029481.
75. Rutledge M, Yap M, Chai K. Plain film mandibular fracture detection using machine learning – model development. *Adv Oral Maxillofac Surg*. 2023 May;11:100436. DOI:10.1016/j.adoms.2023.100436
76. Pham TD, Holmes SB, Coulthard P. A review on artificial intelligence for the diagnosis of fractures in facial trauma imaging. *Front Artif Intell*. 2024 Jan 5:6:1278529. DOI:10.3389/frai.2023.1278529. PubMed PMID: 38249794; PubMed Central PMCID: PMC10797131.
77. Roselló EG, Granado AMQ, Garcia MA, Martí SJ, Laguillo Sala GL, Mármol BB, et al. Facial fractures: Classification and highlights for a useful report. *Insights Imaging*. 2020 Mar 19;11(1):49. DOI:10.1186/s13244-020-00847-w. PubMed PMID: 32193796; PubMed Central PMCID: PMC7082488.
78. Petersson A, Gröndahl HG, Suomalainen A. Computed tomography in oral and maxillofacial radiology. *Nor Tannlegeforen Tid*. 2009;119:86-93. DOI:10.56373/2009-2-3
79. Kaeppler G, Cornelius CP, Ehrenfeld M, Mast G. Diagnostic efficacy of cone-beam computed tomography for mandibular fractures. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2013 Jul;116(1):98-104. DOI:10.1016/j.oooo.2013.04.004. PubMed PMID: 23768877.
80. Mihailova H. Imaging modalities and algorithm in cases of mandibular trauma. *J IMAB-annual Proceeding (Scientific Papers)*. 2008. Available from: https://www.journal-imab-bg.org/statii-08/vol08_2_11-12str.pdf
81. Tyndall DA, Matteson SR, Gregg JM. Computed tomography in diagnosis and treatment of mandibular fractures. Report of a case. *Oral Surg Oral Med Oral Pathol*. 1983 Dec;56(6):567-570. DOI:10.1016/0030-4220(83)90068-3. PubMed PMID: 6581452.
82. Scarfe WC. Imaging of maxillofacial trauma: evolutions and emerging revolutions. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2005 Aug;100(S2):S75-96. DOI:10.1016/j.tripleo.2005.05.057. PubMed PMID: 16037795.
83. Pohlenz P, Blessmann M, Blake F, Heinrich S, Schmelzle R, Heiland M. Clinical indications and perspectives for intraoperative cone-beam computed tomography in oral and maxillofacial surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2007 Mar;103(3):412-417. DOI:10.1016/j.tripleo.2006.05.008. PubMed PMID: 17321455.
84. Lo Casto A, Priolo GD, Garufi A, Purpura P, Salerno S, La Tona G, et al. Imaging evaluation of facial complex strut fractures. *Semin Ultrasound CT MR*. 2012 Oct;33(5):396-409. DOI:10.1053/j.sult.2012.06.003. PubMed PMID: 22964406.
85. Powers DB, Will MJ, Bourgeois SL, Hatt HD. Maxillofacial trauma treatment protocol. *Oral Maxillofac Surg Clin North Am*. 2005 Aug;17(3):341-355, vii. DOI:10.1016/j.coms.2005.05.003. PubMed PMID: 18088790.
86. Stacey DH, Doyle JF, Mount DL, Snyder MC, Gutowski KA. Management of mandible fractures. *Plast Reconstr Surg*. 2006 Mar;117(3):48e-60e. DOI:10.1097/01.prs.0000209392.85221.0b. PubMed PMID:16525255.
87. Shintaku WH, Venturin JS, Azevedo B, Noujeim M. Applications of cone-beam computed tomography in fractures of the maxillofacial complex. *Dent Traumatol*. 2009 Aug;25(4):358-366. DOI:10.1111/j.1600-9657.2009.00795.x
88. Ansari MdK, Ahmed SS, Kumar R, Ekramullah. Diagnostic efficacy of 3D CT vs conventional radiographs in maxillofacial trauma - a comparative study. *Asian Pac J Health Sci*. 2015;2(1):42-50. DOI:10.21276/apjhs.2015.2.1.7
89. Alder ME, Deahl ST, Matteson SR. Clinical usefulness of two-dimensional reformatted and three-dimensionally rendered computerized tomographic images: Literature review and a survey of surgeons' opinions. *J Oral Maxillofac Surg*. 1995 April;53(4):375-386. DOI:10.1016/0278-2391(95)90707-6
90. Follmar KE, Baccarani A, Das RR, Erdmann D, Marcus JR, Mukundan S. A clinically applicable reporting system for the diagnosis of facial fractures. *Int J Oral Maxillofac Surg*. 2007 Jul;36(7):593-600. DOI:10.1016/j.ijom.2007.03.010. PubMed PMID: 17507201.
91. Buitrago-Téllez CH, Schilli W, Bohnert M, Alt K, Kimmig M. A comprehensive classification of craniofacial fractures: postmortem and clinical studies with two- and three-dimensional computed tomography. *Injury*. 2002 Oct;33(8):651-668. DOI:10.1016/s0020-1383(02)00119-5. PubMed PMID: 12213415.
92. Santler G, Kärcher H, Ruda C. Indications and limitations of three-dimensional models in cranio-maxillofacial surgery. *J Craniomaxillofac Surg*. 1998;26(1):11-16. DOI:10.1016/s1010-5182(98)80029-2. PubMed PMID: 9563589.
93. Creasman CN, Markowitz BL, Kawamoto HK, Cohen S, Kioumehr F, Hanafee WN, et al. Computed tomography versus standard radiography in the assessment of fractures of the mandible. *Ann Plast Surg*. 1992;29(2):109-113. DOI:10.1097/00000637-199208000-00002. PubMed PMID: 1530260.
94. Lou L, Lagravere MO, Compton S, Major PW, Flores-Mir C. Accuracy of measurements and reliability of landmark identification with computed tomography (CT) techniques in the maxillofacial area: a systematic review. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2007;104(3):402-411. DOI:10.1016/j.tripleo.2006.07.015. PubMed PMID: 17709072.
95. Ouyang T, Branstetter BF. Advances in head and neck imaging. *Oral Maxillofac Surg Clin N Am*. 2010;22(1):107-115. DOI:10.1016/j.coms.2009.10.002. PubMed PMID: 20159481.
96. SEDENTEXCT Project. Radiation protection N° 172: cone beam ct for dental and maxillofacial radiology evidence-based guidelines. *Eur Comm*. 2012:30-31. Available from: https://sedentexct.eu/files/radiation_protection_172.pdf
97. Gontarz M, Bargiel J, Gąsiorowski K, Marecik T, Szczurowski P, Zapała J, et al. "Air sign" in misdiagnosed mandibular fractures based on ct and cbct evaluation. *Diagnostics*. 2024;14(4):362. DOI:10.3390/diagnostics14040362. PubMed PMID: 38396403; PubMed Central PMCID: PMC10888197.
98. Sandeep Reddy B, Naik D, Kenkere D. Role of multidetector computed tomography in the evaluation of maxillofacial trauma. *Cureus*. 2023 Feb 15;15(2):e35008. DOI: 10.7759/cureus.35008. PubMed PMID: 36938234; PubMed Central PMCID: PMC10021354.
99. Rashid A, Feinberg L, Fan K. The Application of cone beam computed tomography (CBCT) on the diagnosis and management of maxillofacial trauma. *Diagnostics (Basel)*. 2024;14(4):373. DOI:10.3390/diagnostics14040373. PubMed PMID: 38396412; PubMed Central PMCID: PMC10888223.
100. Iqbal A, Yasin A, Javeed M, Rana T, Khan B, Yasin A. The role of MDCT and 3D computed tomography in the assessment of maxillofacial fractures and their types: A tertiary care hospital experience. *J Fatima Jinnah Med Univ*. 2020;14(03):119-123. DOI:10.37018/dvdu4414. [cited 2026 March 8]. Available from: https://www.jfjmu.com/index.php/ojs/article/view/691
101. Alshomrani F. Cone-beam computed tomography (CBCT) - based diagnosis of dental bone defects. *Diagnostics (Basel)*. 2024 Jul 1;14(13):1404. DOI:10.3390/diagnostics14131404. PubMed PMID: 39001294; PubMed Central PMCID: PMC11241660.
102. Warin K, Limprasert W, Suebnukarn S, Paipongna T, Jantana P, Vicharueang S. Maxillofacial fracture detection and classification in computed tomography images using convolutional neural network-based models. *Sci Rep*. 2023 Mar 1;13(1):3434. DOI:10.1038/s41598-023-30640-w. PubMed PMID: 36859660; PubMed Central PMCID: PMC9978019.
103. Da Costa JC. Bandages. Chapter 34. In Da Costa JC, editor. Modern Surgery, 4th edition. Philadelphia, PA: Saunders & Co. 1903. p.11. [cited 2026 March 8]. Available from: https://jdc.jefferson.edu/dacosta_modernsurgery/11
104. Irajpour A, Kaji NS, Nazari F, Azizkhani R, Zadeh AH. A comparison between the effects of simple and traction splints on pain intensity in patients with femur fractures. *Iran J Nurs Midwifery Res*. 2012 Nov-Dec;17(7):530-533. PubMed PMID: 23922601; PubMed Central PMCID: PMC3730458.
105. Boyd AS, Benjamin HJ, Asplund C. Principles of casting and splinting. *Am Fam Physician*. 2009 Jan 1;79(1):16-22. PubMed PMID: 19145960.
106. Yinusa W, Adetan O, Odatuwa-Omagbemi DO, Eyo MU. Bilateral simultaneous fracture of the carpal scaphoid successfully treated with conservative cast immobilisation: a case report. *West Afr J Med*. 2010 Nov-Dec;29(6):425-8. DOI: 10.4314/wajm.v29i6.68299. PubMed PMID: 21465453.
107. Sharif MO, Fedorowicz Z, Drews P, Nasser M, Dorri M, Newton T, et al. Interventions for the treatment of fractures of the mandibular condyle. *Cochrane Database Syst Rev*. 2010 Apr 14;(4):CD006538. DOI:10.1002/14651858.CD006538.pub2. PubMed PMID: 20393948; PubMed Central PMCID: PMC13290141.
108. Baker JL, O'Malley JE. Simplified splint for precise immobilization of the mandible. *Plast Reconstr Surg*. 1971 Dec;48(6):598-599. DOI:10.1097/00006534-197112000-00020. PubMed PMID: 5141280.
109. O'Malley J, inventor. Splint for immobilization of the mandible. United States patent US3759256. 1973 Sept 18.
110. Hachimi-Idrissi S, Coffey F, Dobias V, Hautz W, Leach R, Sauter T, et al. Guidelines for the management of acute pain in emergency care. *Eur Soc Emerg Med*. [cited 2026 March 8]. Available from: https://www.eusem.org/images/EUSEM_EPI_GUIDELINES_MARCH_2020.pdf#:~:text=Professor%20Sa%C3%AFd%20Hachimi%2DIdrissi%20developed%20the,the%20integrity%20of%20the%20guideline
111. American College of Surgeons. Best practices guidelines for acute pain management in trauma patients. *Am Coll Surg*. [cited 2026 March 8]. Available from: https://www.facs.org/media/exob3dwk/acute_pain_guidelines.pdf
112. Jindwani K, Tripathi G, Singh J, Sharma D. A 10 year review on mandibular fractures managed at a tertiary care centre in central India - original study. *Int J Life Sci Biotechnol Pharma Res*. 2023;12(3). [cited 2006 March 8]. Available from: https://ijlbpr.com/uploadfiles/419vol12issue3pp2169-2180.20231007104504.pdf
113. Deininger C, Wichlas F, Necchi M, Deluca A, Deininger S, Trieb K, et al. Enhancing cranio-maxillofacial fracture care in low- and middle-income countries: A systematic review. *J Clin Med*. 2024 Apr 22;13(8):2437. DOI:10.3390/jcm13082437. PubMed PMID: 38673709; PubMed Central PMCID: PMC11050981.
114. National Health and Medical Research Council. Emergency care acute pain management manual. Publish Online 2011. [cited 2026 March 8]. Available from: https://webarchive.nla.gov.au/awa/20151021160717/http://www.nhmrc.gov.au/guidelines-publications/cp135
115. Thorson D, Biewen P, Bonte B, Epstein H, Haake B, Hansen C, et al. Acute pain assessment and opioid prescribing protocol. *Inst Clin Syst Improv*. Available from: https://crh.arizona. edu/sites/default/files/u35/Opioids.pdf
116. Ossendorp R, Forouzanfar T, Ashton-James CE, Bloemers F. Protocols for treating the postoperative pain of fractures in Dutch hospitals. *J Pain Res*. 2013 Aug 13;6:635-639. DOI:10.2147/JPR.S43729. PubMed PMID: 23976863; PubMed Central PMC: PMC3747026.
117. Brown JC, Klein EJ, Lewis CW, Johnston BD, Cummings P. Emergency department analgesia for fracture pain. *Ann Emerg Med*. 2003 Aug;42(2):197-205. DOI:10.1067/mem.2003.275. PubMed PMID: 12883507.
118. Lorentzen V, Hermansen IL, Botti M. A prospective analysis of pain experience, beliefs and attitudes, and pain management of a cohort of Danish surgical patients. *Eur J Pain*. 2012 Feb;16(2):278-288. DOI:10.1016/j.ejpain.2011.06.004. PubMed PMID: 22323380.
119. Collins SL, Moore RA, McQuay HJ. The visual analogue pain intensity scale: what is moderate pain in millimetres? *Pain*. 1997 Aug;72(1-2):95-97. DOI:10.1016/s0304-3959(97)00005-5. PubMed PMID: 9272792.
120. Reichl M, Bodiwala GG. Use of analgesia in severe pain in the accident and emergency department. *Arch Emerg Med*. 1987 Mar;4(1):25-31. DOI:10.1136/emj.4.1.25. PubMed PMID: 3580071; PubMed Central PMCID: PMC1285394.
121. World Health Organization. Cancer Pain Relief. Available from: https://iris.who.int/server/api/core/bitstreams/dc55e9ca-ba7c-4901-b0d0-66e7a7a8b317/content
122. Selbst SM, Clark M. Analgesic use in the emergency department. *Ann Emerg Med*. 1990 Sep;19(9):1010-1013. DOI:10.1016/s0196-0644(05)82565-x. PubMed PMID: 2393166.
123. South African Society of Anesthesiologists. Guidelines for the management of acute pain in specific scenarios. *South Afr Soc Anesthesiol*. [cited 2026 March 8]. Available from: https://painsa.org.za/wp-content/uploads/2024/05/SASA-Acute-Pain-Guidelines-for-specific-

situations-2022.pdf

124. Selvido DI, Bhattarai BP, Rokaya D, Niyomtham N, Wongsirichat N. Pain in oral and maxillofacial surgery and implant dentistry: Types and management. *Eur J Dent*. 2021 Jul;15(3):588-598. DOI:10.1055/s-0041-1725212. PubMed PMID: 34041732.
125. Miloro M, DeLeeuw KA, Ruggiero SL. Parameters of care: clinical practice guidelines for oral and maxillofacial surgery (AAOMS ParCare) 2012: Patient assessment. *J Oral Maxillofac Surg*. 2012 Nov;70(11 Suppl 3):e12-e30. DOI:10.1016/j.joms.2012.07.029. PubMed PMID: 23127999.
126. Mustafa W, Kanagaratnam S, Hamid A, Chelvanayagam P, Yaya E, Wahab Z, et al. Clinical practice guidelines: antibiotic prophylaxis against wound infection for oral surgical procedure. *Minist Health Malays*. Available from: https://www.acadmed.org.my/index.cfm?&menuid=28
127. Singh RP, Carter LM, Whitfield PH. Antimicrobial prophylaxis in open reduction and internal fixation of compound mandibular fractures: a collaborative regional audit of outcome. *Br J Oral Maxillofac Surg*. 2013 Jul;51(5):444-447. DOI:10.1016/j.bjoms.2012.08.019. PubMed PMID: 23369872.
128. Heit JM, Stevens MR, Jeffords K. Comparison of ceftriaxone with penicillin for antibiotic prophylaxis for compound mandible fractures. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 1997 Apr;83(4):423-426. DOI:10.1016/s1079-2104(97)90139-6. PubMed PMID: 9127371.
129. Wahab PUA, Narayanan V, Nathan S, Madhulaxmi. Antibiotic prophylaxis for bilateral sagittal split osteotomies: a randomized, double-blind clinical study. *Int J Oral Maxillofac Surg*. 2013 Mar;42(3):352-355. DOI:10.1016/j.ijom.2012.10.036. PubMed PMID: 23265757.
130. Soong PL, Schaller B, Zix J, Iizuka T, Mottini M, Lieger O. The role of postoperative prophylactic antibiotics in the treatment of facial fractures: a randomised, double-blind, placebo-controlled pilot clinical study. Part 3: Le Fort and zygomatic fractures in 94 patients. *Br J Oral Maxillofac Surg*. 2014 Apr;52(4):329-333. DOI:10.1016/j.bjoms.2014.01.010. PubMed PMID: 24602602.
131. Abubaker AO, Rollert MK. Postoperative antibiotic prophylaxis in mandibular fractures: A preliminary randomized, double-blind, and placebo-controlled clinical study. *J Oral Maxillofac Surg*. 2001 Dec;59(12):1415-1419. DOI:10.1053/joms.2001.28272. PubMed PMID: 11732026.
132. Schaefer EH IV, Caterson EJ. Antibiotic selection for open reduction internal fixation of mandible fractures. *J Craniofac Surg*. 2013 Jan;24(1):85-88. DOI:10.1097/SCS.0b013e318275ef21. PubMed PMID: 23321876.
133. Miles BA, Potter JK, Ellis E. The efficacy of postoperative antibiotic regimens in the open treatment of mandibular fractures: a prospective randomized trial. *J Oral Maxillofac Surg*. 2006 Apr;64(4):576-582. DOI:10.1016/j.joms.2006.01.003. PubMed PMID: 16546635.
134. Andreasen JO, Jensen SS, Schwartz O, Hillerup Y. A systematic review of prophylactic antibiotics in the surgical treatment of maxillofacial fractures. *J Oral Maxillofac Surg*. 2006 Nov;64(11):1664-1668. DOI:10.1016/j.joms.2006.02.032. PubMed PMID: 17052593.
135. Mundinger GS, Borsuk DE, Okhah Z, Christy MR, Bojovic B, Dorafshar AH, et al. Antibiotics and facial fractures: Evidence-based recommendations compared with experience-based practice. *Craniomaxillofac Trauma Reconstr*. 2015 Mar;8(1):64-78. DOI:10.1055/s-0034-1378187. PubMed PMID: 25709755; PubMed Central PMCID: PMC4329036.
136. Ata-Ali J, Ata-Ali F, Ata-Ali F. Do antibiotics decrease implant failure and postoperative infections? A systematic review and meta-analysis. *Int J Oral Maxillofac Surg*. 2014 Jan;43(1):68-74. DOI:10.1016/j.ijom.2013.05.019. PubMed PMID: 23809986.
137. Lovato C, Wagner JD. Infection rates following perioperative prophylactic antibiotics versus postoperative extended regimen prophylactic antibiotics in surgical management of mandibular fractures. *J Oral Maxillofac Surg.* 2009 Apr;67(4):827-832. DOI:10.1016/j.joms.2008.06.093. PubMed PMID: 19304041.
138. Malanchuk VO, Kopchak AV. Risk factors for development of infection in patients with mandibular fractures located in the tooth-bearing area. *J Cranio-Maxillo-fac Surg*. 2007 Jan;35(1):57-62. DOI:10.1016/j.jcms.2006.07.865. PubMed PMID: 17298884.
139. Fairbanks DNF. Pocket Guide to Antimicrobial Therapy in Otolaryngology-Head and Neck Surgery. 13th ed. Alexandria, VA: American Academy of Otolaryngology-Head and Neck Surgery Foundation Inc.; 2007.
140. Wilson W, Taubert KA, Gewitz M, Lockhart PB, Baddour LM, Levison M, et al. Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *Circulation*. 2007 Oct;116(15):1736-1754. DOI:10.1161/CIRCULATIONAHA.106.183095. PubMed PMID: 17446442.
141. Appelbaum RD, Farrell MS, Gelbard RB, Hoth JJ, Jawa RS, Kirsch JM, et al. Antibiotic prophylaxis in injury: an American Association for the Surgery of Trauma Critical Care Committee clinical consensus document. *Trauma Surg Acute Care Open*. 2024 Jun;9(1):e001304. DOI:10.1136/tsaco-2023-001304. PubMed PMID: 38835634; PubMed Central PMCID: PMC11149135.
142. Forrester JD, Wolff CJ, Choi J, Colling KP, Huston JM. Surgical Infection Society Guidelines for antibiotic use in patients with traumatic facial fractures. *Surg Infect*. 2021 Apr;22(3):274-282. DOI:10.1089/sur.2020.107. PubMed PMID: 32598227.
143. Goormans F, Coropciuc R, Vercruysse M, Spriet I, Willaert R, Politis C. Systemic antibiotic prophylaxis in maxillofacial trauma: A scoping review and critical appraisal. *Antibiotics*. 2022 Apr;11(4):483. DOI:10.3390/antibiotics11040483. PubMed PMID: 35453234; PubMed Central PMCID: PMC9027173.
144. Wick EH, Deutsch B, Kallogjeri D, Chi JJ, Branham GH. Effectiveness of prophylactic preoperative antibiotics in mandible fracture repair: A national database study. *Otolaryngol Neck Surg*. 2021 Dec;165(6):798-808. DOI:10.1177/01945998211004270. PubMed PMID: 33845666; PubMed Central PMCID: PMC9293062.
145. Van Der Cruyssen F, Forrest M, Holmes S, Bhatti N. A systematic review and meta-analysis of fracture-related infections in maxillofacial trauma: Incidence, risk factors, and management strategies. *J Clin Med*. 2025 Feb;14(4):1332. DOI:10.3390/jcm14041332. PubMed PMID: 40004862; PubMed Central PMCID: PMC11856410.
146. Atwez A, Antosz K, Cooper L, Le P, Mujadzic T, Seagle J, et al. Preoperative prophylactic antibiotics in mandibular fractures and surgical site infection. *Ann Plast Surg*. 2023 Jun;90(6S):S326-S331. DOI:10.1097/SAP.0000000000003453. PubMed PMID: 37332207.
147. Milic T, Raidoo P, Gebauer D. Antibiotic prophylaxis in oral and maxillofacial surgery: a systematic review. *Br J Oral Maxillofac Surg*. 2021 Jul;59(6):633-642. DOI:10.1016/j.bjoms.2020.09.020. PubMed PMID: 34016464.
148. Kumar D, Dawoud BES, Kent S, MTReC, Kyzas P. Antibiotic practices in non-condylar mandibular fractures: A maxillofacial trainee research collaborative (MTReC) UK-wide survey. *Br J Oral Maxillofac Surg*. 2022 Apr;60(3):291-294. DOI:10.1016/j.bjoms.2021.05.013. PubMed PMID: 34838340.
149. Oksa M, Haapanen A, Stråhlman F. Antibiotic use in mandibular fracture surgery-An international survey and a review of the literature. *Stomatologija*. 2022;24(2):35-42. PubMed PMID: 37140236.
150. Chaudhry H, Hennedige A, Patel M. Review of prophylactic prescribing of antibiotics during the management of fractured mandibles. *The Surgeon*. 2021 Dec;19(6):e519-e525. DOI:10.1016/j.surge.2020.12.009. PubMed PMID: 33582055.
151. Kellman RM, Losquadro WD. Comprehensive airway management of patients with maxillofacial trauma. *Craniomaxillofac Trauma Reconstr*. 2008 Nov;1(1):39-47. DOI:10.1055/s-0028-1098962. PubMed PMID: 22110788; PubMed Central PMCID: PMC3052732.
152. Hagberg CA, Artime CA, Daily WH. The Difficult Airway: A Practical Guide. Oxford: Oxford University Press; 2013. DOI:10.1093/med/9780199794416.001.0001.
153. Watkins TA, Opie NJ, Norman A. Airway choices in maxillofacial trauma. *Trends Anaesth Crit Care*. 2011 Jul;1(4):179-190. DOI:10.1016/j.tacc.2011.05.005.
154. Pavlakovic L, Lee G. Anaesthesia for maxillofacial surgery. *Anaesth Intensive Care Med*. 2014 Aug;15(8):379-384. DOI:10.1016/j.mpaic.2014.04.016.
155. Ray BR, Baidya DK, Goswami D, Trikha A, Roychoudhury A, Bhutia O. Anaesthetic management of maxillofacial trauma. *Trends Anaesth Crit Care*. 2013 Oct;3(5):231-237. DOI:10.1016/j.tacc.2013.07.001.
156. De Melo WM, Brêda MA, Pereira-Santos D, Pereira CCS, Sonoda CK, Araújo MM. Submental endotracheal intubation: A valuable resource for the management of panfacial fractures. *J Craniofac Surg*. 2012 Nov;23(6):1851-1853. DOI:10.1097/SCS.0b013e31826b8345. PubMed PMID: 23147327.
157. Lima SM, Asprino L, Moreira RWF, de Moraes M. A retrospective analysis of submental intubation in maxillofacial trauma patients. *J Oral Maxillofac Surg*. 2011 Jul;69(7):2001-2005. DOI:10.1016/j.joms.2010.10.017. PubMed PMID: 21367502.
158. Schütz P, Hamed HH. Submental intubation versus tracheostomy in maxillofacial trauma patients. *J Oral Maxillofac Surg*. 2008 Jul;66(7):1404-1409. DOI:10.1016/j.joms.2007.12.027. PubMed PMID: 18571024.
159. Jin H, Patil PM. Midline submental intubation might be the preferred alternative to oral and nasal intubation in elective oral and craniomaxillofacial surgery when indicated. *J Oral Maxillofac Surg*. 2015 Jan;73(1):39-46. DOI:10.1016/j.joms.2014.08.018. PubMed PMID: 25511955.
160. Eisemann B, Eisemann M, Rizvi M, Urata MM, Lypka MA. Defining the role for submental intubation. *J Clin Anesth*. 2014 May;26(3):238-242. DOI:10.1016/j.jclinane.2013.09.009. PubMed PMID: 24813811.
161. Raval CB, Rashiduddin M. Airway management in patients with maxillofacial trauma-a retrospective study of 177 cases. *Saudi J Anaesth*. 2011 Jan;5(1):9-14. DOI:10.4103/1658-354X.76476. PubMed PMID: 21655009; PubMed Central PMCID: PMC3101764.
162. Agrawal M, Kang LS. Midline Submental Orotracheal Intubation in Maxillofacial Injuries: A substitute to tracheostomy where postoperative mechanical ventilation is not required. *J Anaesthesiol Clin Pharmacol*. 2010 Oct;26(4):498-502. PubMed PMID: 21547178; PubMed Central PMCID: PMC3087271.
163. Emara TA, El-Anwar MW, Omara TA, Anany A, Elawa IA, Rabea MM. Submental intubation versus tracheostomy in maxillofacial fractures. *Oral Maxillofac Surg*. 2019 Sep;23(3):337-341. DOI:10.1007/s10006-019-00771-4. PubMed PMID: 31093795.
164. Taljard LF, Müller E, Kemp E. Airway management in patients with maxillofacial trauma — Part 2. World Federation of Societies of Anaesthesiologists; 2025 Feb. DOI:10.28923/atotw.542.
165. Al Qooz F, Alanezi M, Sayed AR. Submental intubation – A change in perspective about maxillofacial procedures: A brief review of the literature. *Perioper Care Oper Room Manag*. 2023 Dec;33:100342. DOI:10.1016/j.pcorm.2023.100342.
166. Park DH, Lee CA, Jeong CY, Yang HS. Nasotracheal intubation for airway management during anesthesia. *Anesth Pain Med*. 2021 Jul;16(3):232-247. DOI:10.17085/apm.21040. PubMed PMID: 34352965; PubMed Central PMCID: PMC8342817.
167. Saini S, Singhal S, Prakash S. Airway management in maxillofacial trauma. *J Anaesthesiol Clin Pharmacol*. 2021 Sep;37(3):319-327. DOI:10.4103/joacp.JOACP_315_19. PubMed PMID: 34759538; PubMed Central PMCID: PMC8562439.
168. Ghazal G, Jaquiéry C, Hammer B. Non-surgical treatment of mandibular fractures--survey of 28 patients. *Int J Oral Maxillofac Surg*. 2004 Mar;33(2):141-145. DOI:10.1054/ijom.2003.0458. PubMed PMID: 15050069.
169. Osunde O, Omeje K, Efunkoya A, Adebola A. Oral health-related quality of life in non-surgical treatment of mandibular fractures: A pilot study. *Niger J Exp Clin Biosci*. 2015 Jun;3(1):8. *DOI:* 10.4103/2348-0149.158144.
170. Omeje KU, Adebola AR, Efunkoya AA, Osunde OD, Bamgbose BO, Akhiwu BI, et al. Prospective study of the quality of life after treatment of mandibular fractures. *Br J Oral Maxillofac Surg*. 2015 Apr;53(4):342-346. DOI:10.1016/j.bjoms.2015.01.009. PubMed PMID: 25682422.
171. Arya R, Sritharan R, Glover S, Praveen P, Parmar S, Breeze J. Non-surgical management of non-condylar mandibular fractures. *Br J Oral Maxillofac Surg*. 2022 Nov;60(9):1224-1227. DOI:10.1016/j.bjoms.2022.07.014. PubMed PMID: 36180319.
172. Al-Belasy FA. A short period of maxillomandibular fixation for treatment of fractures of the mandibular tooth-bearing area. *J Oral Maxillofac Surg*. 2005 Jul;63(7):953-956. DOI:10.1016/j.joms.2005.02.008. PubMed PMID: 16003621.
173. Schmidt BL, Kearns G, Gordon N, Kaban LB. A financial analysis of maxillomandibular fixation

versus rigid internal fixation for treatment of mandibular fractures. *J Oral Maxillofac Surg*. 2000 Nov;58(11):1206-1210; discussion 1210-1211. DOI:10.1053/joms.2000.16612. PubMed PMID: 11078130.

174. Ellis E. An algorithm for the treatment of noncondylar mandibular fractures. *J Oral Maxillofac Surg*. 2014 May;72(5):939-949. DOI:10.1016/j.joms.2013.11.026. PubMed PMID: 24480758.
175. Ingole PD, Garg A, Shenoi SR, Badjate SJ, Budhraja N. Comparison of intermaxillary fixation screw versus eyelet interdental wiring for intermaxillary fixation in minimally displaced mandibular fracture: A randomized clinical study. *J Oral Maxillofac Surg*. 2014 May;72(5):958.e1-7. DOI:10.1016/j.joms.2014.01.005. PubMed PMID: 24642133.
176. Amaratunga NA. The relation of age to the immobilization period required for healing of mandibular fractures. *J Oral Maxillofac Surg*. 1987 Feb;45(2):111-113. DOI:10.1016/0278-2391(87)90400-9. PubMed PMID: 3468212.
177. Ajmal S, Khan MA, Jadoon H, Malik SA. Management protocol of mandibular fractures at Pakistan Institute of Medical Sciences, Islamabad, Pakistan. *J Ayub Med Coll Abbottabad JAMC*. 2007 Sep;19(3):51-55. PubMed PMID: 18444592.
178. Bhagol A, Singh V, Singhal R. Management of mandibular fractures. In: Motamedi MHK, editor. A Textbook of Advanced Oral and Maxillofacial Surgery. London: IntechOpen; 2013. p. 385-414. DOI: 10.5772/53854
179. Biswas KP, Sharma D, Chaurasia M, Shakya N, Balke V, Alam A, et al. Comparison between open and closed reduction techniques for mandibular fractures: A systematic review. *Bioinformation*. 2025 Oct;21(10):3451-3455. DOI:10.6026/973206300213451. PubMed PMID: 41623775; PubMed Central PMCID: PMC12859311.
180. Jain A, Rai A. Is the use of intermaxillary fixation screws an alternative to erich arch bars for maxillomandibular fixation during management of maxillofacial fractures? A systematic review and meta-analysis. *Craniomaxillofac Trauma Reconstr*. 2021 Sep;14(3):236-245. DOI:10.1177/1943387520971410. PubMed PMID: 34471480; PubMed Central PMCID: PMC8385628.
181. Jain S, Gupta S. Titanium miniplates versus intraosseus wires as methods of fixation of mandibular fractures: a clinical study. *Indian J Stomatol*. 2011;2(4). [cited 2017 August 3]. Available from: https://www.researchgate.net/publication/328576775_Titanium_miniplates_ versus_ intraosseous_wires_as_methods_of_fixation_of_mandibular_fractures_A_clinical_ study
182. Rahim A, Warraich R. Mandibular fracture osteosynthesis: a comparison of three techniques. *Pak Oral Dent J*. 2009;29(2):201-206. Available from: https://podj.com.pk/archive/Dec_2009/Article-4.pdf
183. Renton TF, Wiesenfeld D. Mandibular fracture osteosynthesis: a comparison of three techniques. *Br J Oral Maxillofac Surg*. 1996 Apr;34(2):166-173. DOI:10.1016/s0266-4356(96)90372-1. PubMed PMID: 8861293.
184. Savani R, Weihsin H, Patel S, Shah N, Chauhan S, Chavda Y. Effective strategies in the management of anterior mandibular fractures: a comprehensive systematic review. *Br J Oral Maxillofac Surg*. 2024 May;62(4):349-360. DOI:10.1016/j.bjoms.2024.02.006. PubMed PMID: 38604919.
185. Freihofer HPM, Sailer HF. Experiences with intraoral trans-osseous wiring of mandibular fractures. *J Maxillofac Surg*. 1973 Dec;1:248-252. DOI:10.1016/S0301-0503(73)80048-7. PubMed PMID: 4521498.
186. van Dijk L, Brons R, Bosker H. Treatment of mandibular fractures by means of stable internal wire fixation. *Int J Oral Surg*. 1977Jun;6(3):173-176. DOI:10.1016/s0300-9785(77)80050-1. PubMed PMID: 408286.
187. Biller JA, Pletcher SD, Goldberg AN, Murr AH. Complications and the time to repair of mandible fractures. *Laryngoscope*. 2005 May;115(5):769-772. DOI:10.1097/01.MLG.0000157328.10583.A7. PubMed PMID: 15867637.
188. Gadkaree SK, Derakhshan A, Nyabenda V, Ncogoza I, Tuyishimire G, Shaye DA. Wire osteosynthesis in the treatment of mandible fractures in low resource settings: A force study. *Craniomaxillofac Trauma Reconstr*. 2024;17(1):13-17. DOI:10.1177/19433875221143605. PubMed PMID: 38371214; PubMed Central PMCID: PMC10874206.
189. Razziq M, Jamal M, Mushtaq I. Comparison of transosseous wiring and miniplates in management of mandibular parasymphyseal fractures. *J Islamabad Med Dent Coll*. 2020 Apr-Jun;9(2):134-139. DOI:10.35787/jimdc.v9i2.393
190. Fordyce AM, Lalani Z, Songra AK, Hildreth AJ, Carton AT, Hawkesford JE. Intermaxillary fixation is not usually necessary to reduce mandibular fractures. *Br J Oral Maxillofac Surg*. 1999 Feb;37(1):52-57. DOI:10.1054/bjom.1998.0372. PubMed PMID: 10203223.
191. El-anwar M, Sayed El-Ahl M, Amer H. Open reduction and internal fixation of mandibular fracture without rigid maxillomandibular fixation. *Int Arch Otorhinolaryngol*. 2015 Oct;19(4):314-318. DOI: 10.1055/s-0035-1549154. PubMed PMID: 26491477.
192. Hsu E, Crombie A, To P, Marquart L, Batstone MD. Manual reduction of mandibular fractures before internal fixation leads to shorter operative duration and equivalent outcomes when compared with reduction with intermaxillary fixation. *J Oral Maxillofac Surg*. 2012 Jul;70(7):1622-1626. DOI:10.1016/j.joms.2012.03.012. PubMed PMID: 22698294.
193. Singh AK, Dahal S, Singh S, Krishna KC, Chaulagain R. Is manual reduction adequate for intraoperative control of occlusion during fixation of mandibular fractures? A systematic review and meta-analysis. *Br J Oral Maxillofac Surg*. 2022 Apr;60(3):271-278. DOI:10.1016/j.bjoms.2021.07.016. PubMed PMID: 3524808.
194. Sobrero F, Roccia F, Vilaplana V, Roig AM, Raveggi E, Ramieri G, et al. Manual versus rigid intraoperative maxillo-mandibular fixation in the surgical management of mandibular fractures: A European prospective analysis. *Dent Traumatol*. 2023 Oct;39(5):448-454. DOI:10.1111/edt.12851 PubMed PMID: 37140473.
195. Dongas P, Hall GM. Mandibular fracture patterns in Tasmania, Australia. *Aust Dent J*. 2002 Jun;47(2):131-137. DOI:10.1111/j.1834-7819.2002.tb00316.x. PubMed PMID: 12139266.
196. Consunji RJ, Larona AJL, Jumangit, Iii AC, Ameratunga SN. Motorcycle-related trauma in the Philippines resulting in hospital admission: The epidemiology of cases at the Philippine General Hospital. *Acta Med Philipp*. 2013;47(3). DOI:10.47895/amp.v47i3.1279
197. Lee KH, Snape L, Steenberg LJ, Worthington J. Comparison between interpersonal violence and motor vehicle accidents in the aetiology of maxillofacial fractures. *ANZ J Surg*. 2007 Aug;77(8):695-698. DOI:10.1111/j.1445-2197.2007.04189.x. PubMed PMID: 17635287.
198. Gagov L. The role of alcohol involvement in maxillofacial trauma. *J IMAB - Annu Proceeding Sci Pap*. 2012;18, 2(2012):147-149. DOI:10.5272/jimab.2012182.147
199. O'Meara C, Witherspoon R, Hapangama N, Hyam DM. Mandible fracture severity may be increased by alcohol and interpersonal violence. *Aust Dent J*. 2011 Jun;56(2):166-170. DOI:10.1111/j.1834-7819.2011.01319.x. PubMed PMID: 21623808.
200. Lee KH. Interpersonal violence and facial fractures. *J Oral Maxillofac Surg Off J Am Assoc Oral Maxillofac Surg*. 2009 Sep;67(9):1878-1883. DOI:10.1016/j.joms.2009.04.117. PubMed PMID: 19686924.
201. Lee K. Trend of alcohol involvement in maxillofacial trauma. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2009 Apr;107(4):e9-13. DOI:10.1016/j.tripleo.2008.12.020. PubMed PMID: 19201626.
202. Agnihotri A, Galfat D, Agnihotri D. Incidence and pattern of maxillofacial trauma due to road traffic accidents: a prospective study. *J Maxillofac Oral Surg*. 2014 Jun ;13(2):184-188. DOI:10.1007/s12663-013-0502-y. PubMed PMID: 24822011; PubMed Central PMCID: PMC4016388.
203. Liu BC, Ivers R, Norton R, Boufous S, Blows S, Lo SK. Helmets for preventing injury in motorcycle riders. *Cochrane Database Syst Rev*. 2008 Jan 23;2008(1):CD004333. DOI:10.1002/14651858.CD004333.pub3. PubMed PMID: 18254047; PubMed Central PMCID: PMC13092890.
204. Republic of the Philippines. Republic Act No. 4136 (1964) *An act to compile the laws relative to land and transportation and traffic rules, to create a Land Transportation Commission and for other purposes*.
205. Republic of the Philippines. Republic Act No. 10054 (2010). *An act mandating all motorcycle riders to wear standard protective motorcycle helmets while driving and providing penalties therefore*.
206. Republic of the Philippines. Republic Act No. 8750 (1999). *An act requiring the mandatory compliance by motorists of private and public vehicles to use seatbelt devices, and requiring vehicle manufacturers to install seat belt devices in all their manufactured vehicles*.
207. Republic of the Philippines. Republic Act No. 10586 (2013). *An act penalizing person driving under the influence of alcohol, dangerous drugs, and similar substances, and for other purposes*.
208. Staton C, Vissoci J, Gong E, Toomey N, Wafula R, Abdelgadir J, et al. Road traffic injury prevention initiatives: A systematic review and metasummary of effectiveness in low and middle income countries. *PloS One*. 2016 Jan 6;11(1):e0144971. DOI:10.1371/journal.pone.0144971. PubMed PMID: 26735918; PubMed Central PMCID: PMC4703343.
209. Usha M, Ravindran V, Soumithran CS, Ravindran Nair KS. The impact of mandatory helmet law on the outcome of maxillo facial trauma: a comparative study in Kerala. *J Maxillofac Oral Surg*. 2014;13(2):176-183. DOI:10.1007/s12663-013-0496-5. PubMed PMID: 24822010; PubMed Central PMCID: PMC4016405.
210. Shepherd J. Preventing violence--caring for victims. *Surg J R Coll Surg Edinb Irel*. 2007 Apr;5(2):114-121. DOI:10.1016/s1479-666x(07)80066-7. PubMed PMID: 17450696.
211. Grillo R, De Oliveira NK, Zindel Deboni MC. The impact of traffic legislation on maxillofacial trauma: A global retrospective review. *J Cranio-Maxillofac Surg*. 2026 Feb;54(2):104402. DOI:10.1016/j.jcms.2025.11.005. PubMed PMID: 41298212.
212. Rahman AFM, Haider I. The Pattern of Mandibular Fractures in Bangladesh: A 3-year cross-sectional retrospective study on 260 patients. *Int J Sci Res Dent Med Sci*. 2021;(Online First). DOI:10.30485/ijsrdms.2021.260064.1099
213. Frimpong P, Nguyen TTH, Sodnom-Ish B, Nimatu ES, Dampare NYA, Rockson R, et al. Incidence and management of mandibular fractures in a low-resource health facility in Ghana. *J Korean Assoc Oral Maxillofac Surg*. 2021 Dec 31;47(6):432-437. DOI:10.5125/jkaoms.2021.47.6.432. PubMed PMID: 34969016; PubMed Central PMCID: PMC8721415.
214. Iqbal S, Aslam A, Ahmed S, Khan N, Kashif M, Kazmi SM. Spectrum of mandibular fractures in a tertiary care hospital of Karachi. *Int J Front Sci*. 2024;4(2):1. DOI:10.37978/tijfs.v4i2.83
215. Laski R, Ziccardi VB, Broder HL, Janal M. Facial trauma: a recurrent disease? The potential role of disease prevention. *J Oral Maxillofac Surg*. 2004 Jun;62(6):685-688. DOI:10.1016/j.joms.2003.12.008. PubMed PMID: 15170278.
216. Singhai J, Nigam R, Jain AK. The demographic study of otorhinolaryngological trauma among patients with head and neck trauma and their management in a tertiary care centre. *Indian J Otolaryngol Head Neck Surg*. 2018 Jun;70(2):249-255. DOI:10.1007/s12070-017-1132-3. PubMed PMID: 29977850; PubMed Central PMCID: PMC6015569.
217. Hoppe IC, Kordahi AM, Lee ES, Granick MS. Pediatric facial fractures: Interpersonal violence as a mechanism of injury. *J Craniofac Surg*. 2015 Jul;26(5):1446-1449. DOI:10.1097/SCS.0000000000001822. PubMed PMID: 26106996.
218. Cirignaco G, Catarzi L, Monarchi G, Committeri U, Frosolini A, Togni L, et al. Interpersonal violence-related facial fractures: 12-year trends and surgical outcomes in a Southern European level-I trauma centre. *Medicina (Kaunas)*. 2025 Aug 11;61(8):1443. DOI:10.3390/medicina61081443. PubMed PMID: 40870488; PubMed Central PMCID: PMC12387832.
219. Delgado-Piedra D, Castillo Ham G, Téliz MA, Salgado-Chavarría F, García-Vázquez P. Patterns of Midface and Mandible Fractures in a Government Hospital. *Craniomaxillofac Trauma Reconstr*. 2024 Sep;17(3):194-202. DOI:10.1177/19433875231151317. PubMed PMID: 39329076; PubMed Central PMCID: PMC11423362.
220. Maniaci A, Lentini M, Vaira L, Lavalle S, Ronsivalle S, Rubulotta FM, et al. The Global Burden of Maxillofacial Trauma in Critical Care: A Narrative Review of Epidemiology, Prevention, Economics, and Outcomes. *Medicina (Kaunas)*. 2025 May;61(5):915. DOI:10.3390/medicina61050915. PubMed PMID: 40428873; PubMed Central PMCID: PMC12113130.
221. Republic of the Philippines. Land Transportation Office. (2019, November 11). Land Transportation Office road safety action plan (Administrative Order No. 2019-038). [cited 2026 March 8] Available from: lto.gov.ph/wp-content/uploads/2023/09/LTO_road_safety_action_plan.pdf

APPENDIX : UPDATED DELPHI PROCESS INSTRUMENT

For each item, please click the number (between 1-9) that is closest to your opinion.

1. HISTORY, CLINICAL PRESENTATION AND DIAGNOSIS *

Clinicians should consider a presumptive diagnosis of mandibular fracture in adults presenting with a history of traumatic injury to the jaw plus a positive tongue blade test, and any of the following physical findings: malocclusion, trismus, tenderness on jaw closure, broken tooth and step deformity.

1 2 3 4 5 6 7 8 9

2. IMAGING (Panoramic Radiography) *

A. Clinicians may request for panoramic xray as the initial imaging tool in evaluating patients with a presumptive clinical diagnosis of mandibular fractures.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

2. IMAGING (Plain Panoramic Radiography) *

B. In a setting where panoramic radiography is not available, clinicians may recommend plain mandibular radiography among patients with presumptive clinical diagnosis of mandibular fracture.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

2. IMAGING (Computed Tomography Scan) *

C. If available, non-contrast Facial CT Scan may be obtained for the assessment of mandibular fractures.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

3. MEDICAL TREATMENT (Immobilization) *

A. Isolated mandibular body fractures should be temporarily immobilized/splinted with a figure-of-eight bandage until definitive surgical management can be performed or while initiating transport during emergency situations.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

3. MEDICAL TREATMENT (Pain Management) *

B. Clinicians should routinely evaluate pain in patients with isolated mandibular body fractures using a numerical pain scale or visual pain analog scale; analgesics should be routinely offered to patients with a numerical rating pain scale of score or VAS of at least 4/10.

Patients may be initially managed with Paracetamol and a mild opioid with or without an adjuvant analgesic. Reassessment should be done and adequate analgesia should be given until the numerical rating pain scale score or VAS 3/10 at most.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

3. MEDICAL TREATMENT (Antibiotics) *

C. Prophylactic antibiotics should be given to adult patient with isolated mandibular body fractures with concomitant mucosal or skin opening with or without direct visualization of bone fragments.

In patients without mucosal or skin lacerations, prophylactic antibiotics can be given 1 hour prior to surgery and up to 24 hours post op.

Penicillin is the drug of choice while Clindamycin may be used as an alternative for patients in whom Penicillin is contraindicated.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

3. MEDICAL TREATMENT (Anesthesia) *

D. Nasotracheal intubation is the preferred route of anesthesia in patients diagnosed with isolated mandibular body fracture.

In the presence of contraindications to nasotracheal intubation, submental intubation or tracheostomy may be performed.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

4. SURGICAL TREATMENT (Observation) *

A. Observation with a soft diet may serve as management for patients diagnosed with favorable isolated nondisplaced and nonmobile mandibular body fracture with unchanged pre - traumatic occlusion.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

4. SURGICAL TREATMENT (Closed Reduction) *

B. Closed reduction with immobilization by maxillomandibular fixation for 4-6 weeks may be considered in patients with minimally displaced favorable isolated mandibular body fracture with stable dentition, good nutrition and who are willing to comply with post-procedure care that may affect oral hygiene, diet modifications, appearance, oral health and functional concerns (eating, swallowing and speech).

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

4. SURGICAL TREATMENT (Open Reduction - Titanium Plates) *

C. a. Open reduction and Internal Fixation using Titanium plates and screws should be performed in isolated displaced unfavorable and unstable mandibular body fracture.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

4. SURGICAL TREATMENT (Open Reduction - Transosseus Wiring) *

C. b. In patients with isolated displaced unfavorable and unstable mandibular body fracture who cannot afford or avail of titanium plates, transosseous wiring with maxillomandibular fixation may be is an option.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

4. SURGICAL TREATMENT (Maxillomandibular Fixation) *

C. c. Intraoperative MMF may not be routinely needed prior to reduction and internal fixation of isolated displaced unfavorable and unstable mandibular body fracture. In selected cases manual anatomical reduction may suffice.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

5. PREVENTION *

A. Clinicians should advocate for compliance with road traffic safety laws (speed limit, anti-drunk driving, seatbelt and helmet use) for the prevention of motor vehicle, cycling and pedestrian accidents and maxillofacial injuries.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree

5. PROMOTION *

B. Clinicians should play a positive role in the prevention of interpersonal and collective violence as well as the settings in which violence occurs in order to avoid injuries in general and mandibular fractures in particular.

1 2 3 4 5 6 7 8 9
Strongly Disagree Strongly Agree